Thermo NESLAB

Merlin Recirculating Chillers

Thermo NESLAB Manual P/N U00659
Rev. 10/17/01

Installation
Operation
Basic Service

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Constant Temperature Bath/Circulators
Immersion Coolers
Recirculating Chillers

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WARRANTY

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Preface

Compliance

60 Hertz

CSA-C22.2 No 1010-1

UL-3101-1

50 Hertz

Products tested and found to be in compliance with the requirements defined in the EMC standards defined by 89/336/EEC as well as Low Voltage Directive (LVD) 73/23/EEC can be identified by the CE Mark on the rear of the unit. The testing has demonstrated compliance with the following directives:

LVD, 73/23/EEC	EN 61010-1:1993
EMC, 89/336/EEC	EN 55011, Class A Verification
	EN 50082-1:1992
	IEC 61000-4-2:1999
	IEC 61000-4-3:1998
	IEC 61000-4-4:1995
	IEC 61000-4-5:1995
	IEC 61000-4-6:1996

For any additional information, refer to the Declaration of Conformity that shipped with the unit.

Unpacking

Retain all cartons and packing material until the unit is operated and found to be in good condition. If the unit shows external or internal damage, or does not operate properly, contact the transportation company and file a damage claim. Under ICC regulations, this is your responsibility.

Warranty

Units have a warranty against defective parts and workmanship for 24 months from date of shipment. See back page for more details.

NES-care Extended Warranty Contract

- Extend parts and labor coverage for an additional year.
- Worry-free operation.
- Control service costs.
- Eliminate the need to generate repair orders.
- No unexpected repair costs.

Other contract options are available. Please contact Thermo NESLAB for more information.

After-sale Support

Thermo NESLAB is committed to customer service both during and after the sale. If you have questions concerning the unit operation, contact our Sales Department. If your unit fails to operate properly, or if you have questions concerning spare parts or Service Contracts, contact our Service Department.

Before calling, *please* obtain the following information:

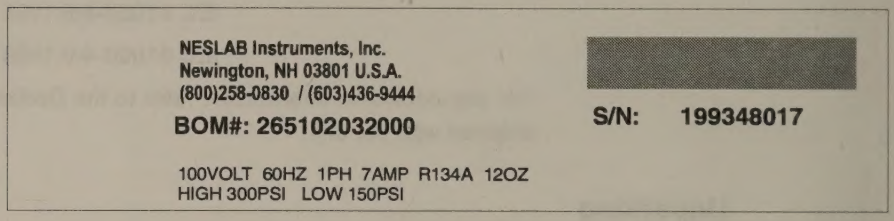
- *unit BOM number* _____

- *unit serial number* _____

- *unit software version* _____

- *voltage of power source* _____

The unit's BOM and serial number label are located on the label rear of the unit. See page 36 for instructions on how to display the software version.



See page 40 for instructions on how to decode your unit's BOM number.

Section I Safety

Warnings

Warnings are posted throughout the manual. These warnings are designated by an exclamation mark inside an equilateral triangle and text highlighted in bold. Read and follow these important instructions. Failure to observe these instructions can result in permanent damage to the unit, significant property damage, or personal injury or death.

The lightning flash with arrow symbol, within an equilateral triangle, is intended to alert the user to the presence of non-insulated "dangerous voltage" within the unit's enclosure. The voltage may be of significant magnitude to constitute a risk of electrical shock.

Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your unit. If you have any questions concerning the operation of your unit or the information in this manual, please contact our Sales Department (see After-sale Support).

Never place the unit in a location where excessive heat, moisture, or corrosive materials are present.

The unit construction provides extra protection against the risk of electrical shock by grounding appropriate metal parts. The extra protection may not function unless the power cord is connected to a properly grounded outlet. It is the user's responsibility to assure a proper ground connection is provided.

Never connect the inlet or outlet fitting to your building water supply or any water pressure source.

Never use flammable or corrosive fluids with this unit. Highly distilled and deionized water may be aggressive and cause material corrosion. Please contact ThermoNESLAB before subjecting this unit to prolonged exposure to highly distilled or deionized water.

Do not use automotive antifreeze. Commercial antifreeze contains silicates that can damage the pump seals. Use of automotive antifreeze will void the manufacturer's warranty.

Additional Warnings

In addition to the specific warnings listed on the previous page the following general warnings apply to your unit:

Performance of installation, operation, or maintenance procedures other than those described in this manual may result in a hazardous situation and may void the manufacturer's warranty.

Transport the unit with care. Sudden jolts or drops can damage the refrigeration lines.

If the unit is to be transported and/or stored it needs to be drained. If the unit is to be transported and/or stored in cold temperatures it needs to be drained and then flushed with a 50/50 glycol/water mixture.

Observe all warning labels.

Never remove warning labels.

Never operate damaged or leaking equipment.

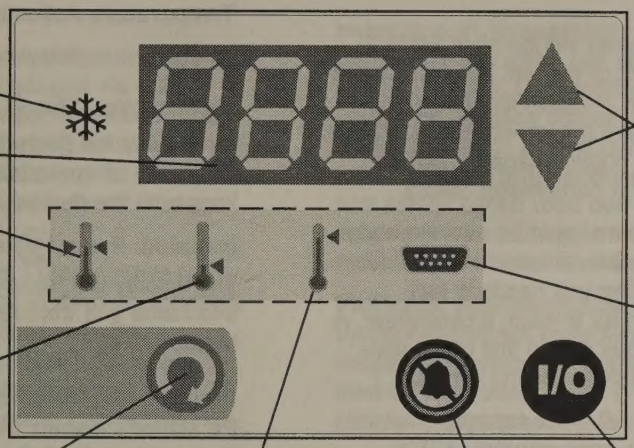
Never operate the unit without cooling fluid in the reservoir.

Always turn off the unit and disconnect the power cord from the power source before performing any service or maintenance procedures, or before moving the unit.

Never operate equipment with damaged power cords.

Refer service and repairs to a qualified technician.

Section II General Information



Indicates **refrigeration system status**. See page 26.

Optional. Flashes to indicate the **external sensor** is enabled. See page 33.

Indicates the controller is displaying the **setpoint**. Press the arrow keys to change the value. See page 27.

Indicates the controller is displaying the unit's **low temperature alarm setting**. Press the arrow keys to change the value. See page 27.

Press to **sequence** through the four indicators and accept the displayed value. See page 26. **NOTE:** None of the four indicators are visible unless this key is pressed.

Indicates the controller is displaying the **high temperature alarm setting**. Press the arrow keys to change the value. See page 27.

Press to **change** the displayed value. See page 26.

Optional. Indicates the unit is operating in the **serial communication** or remote start/stop mode. See page 27.

Press to **start/stop** the unit. See page 26.

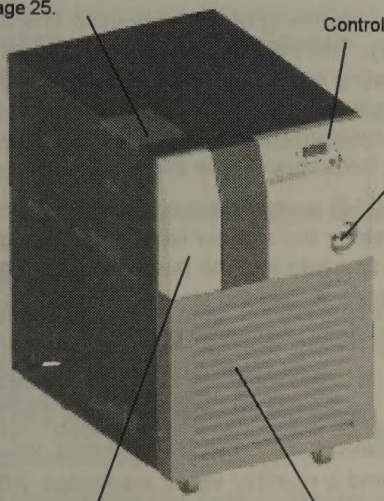
Press to **mute** the alarm. See page 26.

Reservoir Access Panel. See page 25.

Controller. See page 26.

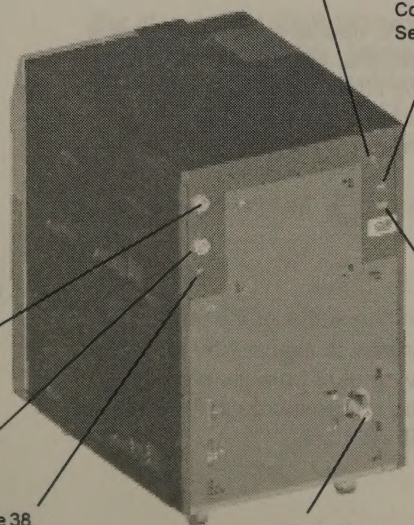
Indicates a **Merlin Operating Tip**.

Pressure Gauge. See page 28.



Circuit Breaker. See page 26.

Optional
Communications Connector. See page 31.



Reservoir. See page 25.

Condenser Access Panel. See page 37.

Plumbing Return Connection. See page 24.

Plumbing Supply Connection. See page 24.

PD Pump Pressure Relief Valve. See page 38.

Optional
Remote Start/Stop Connector. See page 32.

Drain. See page 24.

Quick Reference Operating Procedures

Installation

The unit has an air-cooled refrigeration system. Air is drawn in the front of the unit and discharged through rear and sides. Position the unit so the intake and discharge are not impeded. Inadequate ventilation will reduce cooling capacity and, in extreme cases, result in compressor failure.

Excessively dusty areas should be avoided and a periodic cleaning schedule should be instituted. For proper operation, the unit needs to pull substantial amounts of air through a condenser. A build up of dust or debris on the fins of the condenser will lead to a loss of cooling capacity.

The unit will retain its full rated capacity in ambient temperatures up to approximately +77°F (+25°C).

Make sure the voltage of the power source meets the specified voltage, ±10%.

The plumbing connections are located on the rear of the unit and are labelled and . These connections are ½ inch FPT (¾ inch FPT for units with CP-55 pumps). Remove the plastic protective plugs from both plumbing connections. Connect the fitting to the inlet of your application. Connect the fitting to the outlet of your application.

To fill the reservoir, remove the reservoir access panel and locate the reservoir cap. Remove the cap and fill the reservoir with clean cooling fluid.

For fluid recommendations refer to page 24.

Operation

Before starting the unit, double-check all electrical and plumbing connections. Make sure the circulating system is properly filled with cooling fluid. Place the circuit breaker located on the rear of the unit to the up position.

To start the unit, press I/O. To turn the unit off press I/O again.

The ❄ LED indicates the status of the refrigeration system. It illuminates to indicate the refrigeration system is removing heat from the cooling fluid. As the operating temperature approaches the setpoint, the LED will flash.

Temperature Adjustment

To display the temperature setpoint, press on the controller. The indicator will illuminate and the display will flash the current setpoint value. To adjust the temperature setpoint, press the arrow keys until the desired temperature setpoint is indicated. Press again to confirm the change. The display will rapidly flash the new value for a short time and then return to the recirculating fluid temperature.

Periodic Maintenance

Periodically inspect the reservoir fluid. If cleaning is necessary, flush the reservoir with a cleaning fluid compatible with the circulating system and the cooling fluid.

The cooling fluid should be replaced periodically. Frequency depends on the operating environment and amount of usage.

Before changing the cooling fluid ensure it is at a safe temperature.

Periodic vacuuming of the condenser fins is necessary. The frequency of cleaning depends on the operating environment. We recommend a monthly visual inspection of the condenser after initial installation. After several months, the cleaning frequency will be established.

Units with PD pumps have a strainer. If debris is in the system, the strainer will prevent the material from being drawn into the pump and damaging the pump vanes. A clogged strainer will also cause increased pump discharge pressure.

After initial installation, the strainer may become clogged. **Clean the strainer after the first week of installation.** After this first cleaning, we recommend a monthly visual inspection. After several months, the cleaning frequency will be established. Before cleaning the strainer, disconnect the power cord from the power source and drain the unit.

Kom hurtigt i gang!

Installering
Merlin-serien er luftkølet. Luftindtaget sker via ribber i kølebadets front, luftudtaget via huller bagpå og i siderne af kølebadet. Kølebadet skal anbringes således, at luftindtag og luftudtag ikke hindres. Utilstrækkelig ventilation vil forårsage nedsat kølekapacitet, og i værste fald ødelægge kompressoren.

Undgå at anbringe kølebadet i meget støvede omgivelser. Det anbefales, at indføre en periodisk og systematisk rengøringsprocedure. En kondenser sikrer kølebadets store luftindtag. Ophobning af f.eks. støv eller snavs på køleribberne medfører en nedsat kølekapacitet.

Omgivelsestemperaturen må max. være 25°C for at sikre bedst mulig drift.

Spændingen skal være 220V.

Rørtilslutningerne er anbragt på bagsiden af kølebadet og er afmærkede. Tilslutningerne er 1/2" FPT. (Kølebade med CP-55 pumpe har 3/4" FPT tilslutning). Den beskyttende plastik om begge rørtilslutninger fjernes. Tilslutningsslangen forbindes til kølebadets tilslutningsstykke. Afløbsslangen forbindes til kølebadets afløbsstykke.

Afmonter dernæst panelet til væskebeholderen. Fjern dækslet og fyld ren kølevæske i væskebeholderen.

Se side 24 i betjeningsvejledningen for anbefalet kølevæske.

Ibrugtagning
Før kølebadet tages i brug, kontrolleres alle elektriske og mekaniske tilslutninger pånyt. Påse ligeledes at kølevæske er fyldt på cirkulationssystemet. Afbryderknappen til cirkulationssystemet er anbragt bag på kølebadet. Afbryderen sættes i øverste position.

For at starte kølebadet, trykkes afbryderen ned. Når kølebadet skal stoppe, trykkes ned igen.

❄ LED displayet viser kølesystemets status. Når varme fjernes fra kølevæsken, lyser displayet. Når driftstemperaturen nærmer sig setpunktet, vil LED displayet blinke.

Indstilling af temperatur
Setpunktet kan vises ved at trykke på kontrolenheden. Det indstillede setpunkt vil blinke i displayet. Ønskes setpunktet ændret, trykkes på piltasterne, indtil ønsket temperatur vises. Tryk igen for at bekræfte ændringen. Displayet vil i et kort øjeblik blinke med den valgte temperatur og vender dernæst tilbage med visning af den recirkulerende væsketemperatur.

Periodisk vedligeholdelse
Væskebeholderen kontrolleres regelmæssigt. Er rengøring nødvendig, skylles væskebeholderen med en rensevæske, der er forenelig med cirkulationssystemet og kølevæsken.

Kølevæsken udskiftes regelmæssigt afhængig af omgivelsestemperaturen og hvor tit køleren er i brug.

Inden udskiftning af kølevæske, skal kølevæskens temperatur altid kontrolleres.

Køleribberne bør altid holdes fri for støv og snavs. Hvor tit ribberne skal tørres af, afhænger af hvor støvede omgivelserne er. Fra fabrikkens side anbefales en månedlig inspektion af kondensoren, efter kølebadets første ibrugtagning. Dernæst bør en rengøringsprocedure indføres, således at der sikres en regelmæssig og systematisk rengøring af køleren.

Kølebade med PD-pumper har monteret et filter. Filtret forhindrer støv og snavs i at trænge ind i pumpen og ødelægge pumpefanerne. Et tilstoppet filter vil ligeledes forårsage øget tryk på afløbspumpen.

For at undgå, at filtret tilstoppes, anbefales det, at rense filtret ugen efter, køleren har været i brug første gang. Herefter bør filtret kontrolleres en gang om måneden. Inden filtret renses, skal stikket trækkes ud af stikkontakten og kølebadet tømmes for kølevæske.

PROCEDURES DE MISE EN ROUTE

1°) INSTALLATION

Il s'agit d'un groupe dont le condenseur est refroidi par air. L'air est aspiré à l'avant et rejeté sur les côtés et à l'arrière. Il faut donc que chaque côté soit suffisamment aéré. Une mauvaise ventilation affecte la capacité de refroidissement du groupe et peut entrainer des dommages au compresseur.

Un endroit très poussiereux est donc à proscrire, et un nettoyage périodique des entrées d'air fortement recommandé.

La capacité du groupe reste maximale pour une température ambiante n'excédant pas 25°C.

S'assurer que la tension d'alimentation soit celle spécifiée à +/-10 Volts

Les connexions sont situées à l'arrière de l'appareil (diamètre 0,5 pouce FPT sauf pour les versions avec pompe CP 55 dont le diamètre est alors de 3/4 pouce). Oter les protections en plastique et connecter le départ et le retour à votre application.

Pour remplir le réservoir, oter le panneau et s'assurer de la propreté et de la bonne compatibilité du fluide utilisé.

2°) MISE EN ROUTE

Avant de mettre en route vérifier le branchement électrique, les connexions entre le groupe et votre application et s'assurer que le le réservoir soit correctement rempli. Placer le bouton à l'arrière en position haute.

Pour mettre en route, apuyer sur la touche., pour éteindre appuyer à nouveau sur la même touche.

Une diode ❄ LED s'allume pour indiquer que le groupe commence à refroidir et se met à flasher lorsque la température de consigne est presque atteinte.

3°) REGLAGE DE LA TEMPERATURE

Appuyer sur la touche du controleur de température pour sélectionner une température de consigne. Le témoin s'allume et cette température de consigne flashe. Pour en changer utiliser les flèches de réglage haut et bas jusqu'à l'obtention de la température souhaitée. Presser à nouveau pour valider. Cette nouvelle valeur flashera quelques secondes avant d'être remplacée par la température présente.

4°) MAINTENANCE PERIODIQUE

Vérifier le fluide dans le réservoir. S'il est sale veuiller rincer et le changer ou rajouter un produit tout en s'assurant de sa bonne compatibilité. La périodicité dépend des conditions locales d'utilisation.

Avant de changer le liquide s'assurer qu'on soit à une température qui ne présente aucun risque.

Nettoyer les grilles du condenseur. La périodicité dépend du degré de propreté du local. Commencer par une première inspection au bout d'un mois de fonctionnement puis espacer les vérifications s'il y a lieu.

Les pompes type PD sont munies d'un filtre de protection dont le rôle est d'empêcher des impuretés ou des corps étrangers d'endommager les corps de pompe. Pour éviter d'éventuelles pertes de charge il convient de nettoyer ces filtres. La première inspection doit s'effectuer une semaine après la mise en route de l'appareil. Ensuite nous préconisons une vérification tous les mois voire moins selon l'état dudit filtre. Avant de nettoyer ce filtre déconnecter l'appareil et vidanger.

Installazione

L'unità è dotata di un condensatore raffreddato ad aria. Il flusso d'aria per il raffreddamento viene prelevato frontalmente ed espulso posteriormente e lateralmente.

IMPORTANTE

"Posizionare lo strumento in modo da evitare l'ostruzione di tali accessi. Una ventilazione non appropriata comporterà una riduzione della capacità refrigerante ed, in casi estremi, danni al compressore.
L'apparecchiatura mantiene la massima capacità di raffreddamento con una temperatura ambiente fino a 25C° circa".

È opportuno evitare la locazione dell'unità in ambienti troppo polverosi e provvedere periodicamente ad una pulizia del condensatore. Assicurarsi che la tensione di alimentazione rispetti quella specificata +/- 10%.

Le connessioni idrauliche (1/2 pollici FPT o ¾ pollici FPT con pompe idrauliche del tipo CP-55) sono posizionate ed indicate nel retro dello strumento e per accedervi rimuovere l'apposita protezione plastica.
Per accedere alla tanica di riserva del fluido rimuovere il pannello di accesso ed il relativo tappo protettivo, quindi riempire il serbatoio con l'adeguato fluido refrigerante (è possibile verificare il livello del fluido refrigerante attraverso il pannello frontale trasparente).

Per le caratteristiche del fluido riferirsi a pagina 24.

Messa in servizio
Assicurarsi che le connessioni elettriche ed il livello di riempimento del fluido refrigerante siano appropriati.
Attivare l'interruttore differenziale (locato sul retro dello strumento) spostando la leva di attuazione nella posizione alta.

Per attivare lo strumento premere I/O

Per disattivare lo strumento premere I/O

Sul pannello di controllo frontale è presente un ❄ LED che indica lo stato di funzionamento del sistema di refrigerazione. Nel caso in cui il LED sia illuminato il sistema sta rimuovendo il calore dal fluido refrigerante. Quando la temperatura controllata raggiunge il set-point impostato il LED continuerà a lampeggiare.

Impostazione della temperatura
Per visualizzare il set-point della temperatura premere sul controller il tasto impostazione della temperatura. Un segnale luminoso indicherà la funzione di settaggio ed il display, ad intervalli regolari, visualizzerà il set-point che potrà essere modificato premendo .
Una volta effettuata la variazione premere il tasto di conferma per memorizzare la nuova impostazione, che verrà brevemente visualizzata sul display.

Manutenzione periodica
Ispezionare periodicamente la tanica di riserva del fluido. Se fosse necessaria una pulizia utilizzare un fluido compatibile con il sistema idraulico di circolazione ed il fluido refrigerante.
Il fluido refrigerante dovrebbe essere periodicamente sostituito in base alle condizioni ambientali ed al tempo di utilizzo.

"Prima di cambiare il fluido refrigerante assicurarsi che esso sia ad una temperatura di sicurezza"

Periodicamente soffiare il condensatore, se necessario. Anche in questo caso la frequenza dell'operazione dipende esclusivamente dalle condizioni ambientali.
Si consiglia almeno un controllo mensile visivo, dopo l'installazione, così da valutare una appropriata frequenza di pulizia.

Le unità, nelle quali sono installate delle pompe del tipo PD, sono dotate di un filtro che trattiene eventuali impurità solide evitandone il flusso attraverso la pompa stessa.
Una settimana dopo l'installazione iniziale si consiglia di pulire accuratamente questo filtro, in quanto l'intasamento di quest'ultimo potrebbe causare un incremento nella pressione di mandata della pompa. Dopo la prima pulizia controllare mensilmente le condizioni del filtro in modo da valutare un'appropriata frequenza di pulizia.

" Prima di procedere alla pulizia del filtro disconnettere la tensione di alimentazione e svuotare il serbatoio dal fluido refrigerante tramite l'apposito scarico posizionato nel retro dell'unità".

Kurzbedienungsanleitung

Installation

Das Gerät verfügt über ein luftgekühltes Kühlsystem. Die Luft wird an der Vorderseite angesaugt und strömt an den Seitenwänden und an der Rückseite aus. Das Gerät muß so plaziert werden, daß weder die Ansaug- noch die Ausströmöffnungen blockiert sind. Bei ungenügender Ventilation wird die Kühlleistung reduziert und kann in extremen Situationen zum Ausfall des Kühlsystems (Kompressor) führen.

Vermeiden Sie Aufstellorte mit hoher Staubentwicklung und reinigen Sie das Gerät in regelmäßigen Abständen. Um eine einwandfreie Funktion zu gewährleisten, muß das Gerät ausreichend Luft Zu- und Abfuhr haben. Bei Staub- und Schmutzablagerungen auf dem Kondensator kommt es zu einem Verlust an Kühlleistung.

Das Gerät arbeitet mit seiner maximalen Kühlleistung bis zu einer Umgebungstemperatur von ca. 25°C.

Vergewissern Sie sich, daß die Netzspannung mit der für das Gerät vorgesehenen Spannung übereinstimmt (±10%).

Die Schlauchanschlüsse des Gerätes befinden sich an der Rückseite und sind mit ⊡▶ und ◀⊡ bezeichnet. Die Anschlüsse haben ein ½ Zoll FPT Innengewinde, bzw. ¾ Zoll FPT bei Geräten mit CP-55 Pumpe. Bitte entfernen Sie die Kunststoff-Schutzkappen von den Anschlüssen. Schließen Sie den ⊡▶ an den Eingang Ihres Instruments und den ◀⊡ an den Ausgang Ihres Instruments an.
Um das Reservoir zu füllen, öffnen Sie den Reservoir-Schutzdeckel. Entfernen Sie den Reservoir verschluß und befüllen Sie das Reservoir mit sauberer Kühlflüssigkeit.
Geeignete Flüßigkeiten finden Sie auf Seite 24.

Inbetriebnahme

Vor Inbetriebnahme des Gerätes vergewissern Sie sich bitte nochmalig, daß die elektrischen Anschlüsse und die Rohr- u. Schlauchanschlüsse sachgemäß installiert sind und das gesamte System mit Kühlflüssigkeit gefüllt ist.
Um das Gerät einzuschalten, müssen Sie erst den Hauptschalter an der Rückseite des Gerätes auf „Ein“ stellen und dann I/O drücken. Zum Abschalten des Gerätes I/O erneut drücken.

Die ❄ LED-Anzeige an der Anzeigetafel leuchtet auf, so lange das Kühlsystem der Kühlflüssigkeit Wärme entzieht. Ist die gewünschte Temperatur erreicht (setpoint), blinkt die LED-Anzeige.

Einstellung der Temperatur

Um den Temperatursollwert anzuzeigen, drücken Sie die ◉ Taste des Controllers. Die 🌡 LED leuchtet und die Anzeige blinkt mit dem eingestellten Sollwert. Um den Temperatursollwert zu ändern, drücken Sie Pfeiltasten, bis dere gewünschte Sollwert in der Digitalanzeige angezeigt wird. Drücken Sie die ◉ Taste erneut um den Wert zu bestätigen. Die Digitalanzeige zeigt kurz den neu eingestellten Sollwert schnell blinkend, um dann wieder die Temperatur der Kühlflüssigkeit anzuzeigen.

Wartung

Überprüfen Sie regelmäßig die Kühlflüssigkeit im Reservoir. Sollte eine Reinigung notwendig sein, spülen Sie das Reservoir mit einer speziellen Reinigungsflüssigkeit, die für das Leitungssystem und die Kühlflüssigkeit geeignet ist.
Das Kühlmittel sollten Sie in regelmäßigen Abständen erneuern. Wenn Sie das Gerät bei niedrigen Temperaturen betreiben, erhöht sich mit der Zeit der Wasseranteil in der Kühlflüssigkeit. Dies führt zum Verlust von Kühlkapazität.

Vor dem Austausch der Kühlflüssigkeit erhöhen Sie bitte die Betriebstemperatur des Gerätes so weit, daß die Kühlspulen eisfrei sind.
Regelmäßiges Absaugen des Kühlkörpers ist erforderlich. Die Reinigungshäufigkeit hängt von der Betriebsumgebung ab. Eine monatliche Überprüfung des Kondensators ist empfehlenswert. So werden Sie nach einigen Monaten einen Reinigungsrhythmus gefunden haben.

Geräte mit PD-Pumpen sind mit einem Pumpenfilter ausgestattet. Der Filter verhindert, daß kleine Teilchen und Schmutzablagerungen in die Pumpe gelangen und so die Pumpenflügel beschädigen. Ein verstopfter Filter führt zu einem erhöhten Druckverlust.

Nach der ersten Installation kann es zu einer Verunreinigung des Filters kommen. Die erste Reinigung sollte daher nach einer Woche erfolgen. Danach empfehlen wir eine monatliche Überprüfung des Filters. So können Sie nach einiger Zeit abschätzen, wie oft der Filter gereinigt werden muß. Bevor Sie den Filter reinigen, ziehen Sie den Netzstecker und entleeren Sie das Gerät.

Verkorte handleiding

Installatie
Het apparaat heeft een luchtgekoeld koelsysteem. De luchtinlaat is aan de voorzijde. De luchtuitlaat is aan de twee zijkanten en aan de achterzijde. Plaats het apparaat zo dat de luchtaanvoer niet geblokkeerd is. Bij onvoldoende luchtdoorstroming zal het koelvermogen afnemen. In extreme gevallen zal de compressor uitvallen.

Plaats het apparaat niet in stoffige ruimtes. Maak het apparaat regelmatig schoon. Voor een goede werking moet het apparaat voldoende lucht door de condensor laten stromen. Een ophoping van stof of andere deeltjes zullen het koelvermogen nadelig beinvloeden.

Het apparaat zal de opgegeven specificaties halen tot een omgevingstemperatuur van ongeveer +77°F (+25°C).

Het voltage moet voldoen aan het opgegeven voltage, ±10%.

De aansluitingen voor de waterslangen zijn gelabeld en bevinden zich aan de achterzijde. De aansluitingen zijn ½ inch FPT (¾ inch FPT voor apparaten met een CP-55 pomp). Verwijder de plastic beschermdopjes die zich in de aansluitingen voor de waterslangen bevinden. Sluit de "Outlet" van het apparaat aan op de "Inlet" van uw toepassing. Sluit de "Inlet" van het apparaat aan op de "Outlet" van uw toepassing

Verwijder het paneel wat toegang geeft tot de vulopening van het vloeistofreservoir. Verwijder de dop van het vloeistofreservoir en vul het reservoir met schone vloeistof.

Voor aanbevelingen over vloeistoffen verwijzen wij naar pagina 24.

In bedrijf stellen
Check, voor het opstarten, alle aansluitingen. Overtuig u ervan dat het apparaat op de juiste manier is gevuld met koelvloeistof. Aan de achterzijde van het apparaat bevind zich de schakelaar voor de zekering. Deze schakelaar moet naar boven staan.

Om het apparaat te starten druk op "start/stop". Om het apparaat uit te schakelen druk nogmaals op "start/stop".

De ❄ LED geeft de status van het koelsysteem aan. De LED gaat aan als het apparaat warmte ontrekt aan de koelvloeistof. Op het moment dat de ingestelde temperatuur wordt bereikt zal de LED gaan knipperen.

Temperatuur Instelling
Druk op de controller om de ingestelde temperatuur te zien. De indicator licht op en de ingestelde waarde knippert. Druk op de knop met het pijltje totdat de gewenste temperatuur is ingesteld. Druk nogmaals op de knop met het pijltje om de wijziging te bevestigen. De display knippert enkele malen snel en zal dan weer de actuele temperatuur laten zien.

Periodiek onderhoud
Controleer regelmatig de vloeistof. Als de vloeistof ververst moet worden handel dan als volgt:

Laat de vloeistof uit het apparaat lopen. Aan de achterzijde van het apparaat bevindt zich een afvoerkraantje.

Spoel het reservoir door met een spoelvloeistof die geschikt is voor het apparaat en de koelvloeistof.

Het is noodzakelijk om de ribben van de condensor regelmatig schoon te maken met behulp van een stofzuiger. Check de condensor maandelijks. Na enige maanden kunt u de frequentie van het schoonmaken bepalen.

Apparaten met een PD pomp hebben een filter. Het filter beschermt de pomp tegen deeltjes die in het vloeistofcircuit kunnen komen. Een vies filter zal de druk in het koelcircuit verhogen.

Na de eerste opstart is er een verhoogde kans op een vervuild filter. **Maak na één week het filter schoon.** Wij adviseren een maandelijkse inspectie van het filter. Na een aantal maanden kunt u de frequentie van inspecties aanpassen. Haal de stekker uit het stopcontact voordat u het filter gaat schoonmaken.

Stručný návod k obsluze

Instalace
Jednotka je chlazena vzduchem. Vzduch je nasáván předním panelem a je odváděn bočními panely a zadním panelem. Vždy umístěte jednotku tak, aby nebyl kladen odpor proudění vzduchu. V opačném případe dojde ke snížení chladicího výkonu a v extrémních případech i k poruše kompresoru.

Je třeba se vyvarovat nadměrně prašného přostredí a stanovit a dodržovat interval pravidelného čištění kondenzátoru. Pro správnou funkci jednotky je třeba, aby kondenzátorem proudilo dostatečné množství vzduchu. Úsady prachu a nečistot na žebrech kondenzátoru se projeví snížením chladicího výkonu.

Jednotka je schopna podávat deklarovaný chladicí výkon až do okolní teploty +25°C.

Napájecí napětí nesmí překročit nominální hodnotu ±10%.

Připojení okruhu cirkulační kapaliny se provádí pomocí přípojek umístěných na zadním panelu jednotky. Přípojky jsou označeny a . Rozměr fittingů je ½ " FPT (¾ " FPT pro jednotky s čerpadlem CP-55). Vyjměte plastové ochranné vložky z obou nátrubků. Pripojte přívod a odvod vaší aplikace, t.j. externího zařízení které temperujete na požadovanou teplotu.

Plnění rezervoáru se provádí po otevření přístupového panelu a vyšroubování zátky rezervoáru. Rezervoár se poté naplní vhodnou cirkulační kapalinou.

Doporučené parametry cirkulační kapaliny jsou specifikovány na straně 24.

Provoz
Před zahájením provozu je třeba opakovaně prověřit elektrické připojení a cirkulační obvody jednotky. Cirkulační obvod musí být zaplněn vhodnou cirkulační kapalinou. Sítový spinač na zadní stěně jednotky poté umístíme do horní polohy.

K zahájení provozu stiskněte . K vypnutí jednotky opět stisknete .

❄ LED kontrolka indikuje stav chladicího systému. Pokud svítí, signalizuje že chladicí systém momentálně běží a odvádí teplo cirkulační kapalině. Pokud se teplota cirkulační kapaliny přiblíží požadované operační teplotě, kontrolka začne blikat.

Nastavení teploty
Po zapnutí jednotky se zobrazí pozadovaná teplota cirkulační kapaliny. Po stisknutí kontrolního tlačítka displej začne blikat. Šipkami nahoru nebo dolů nastavíte, pokud je třeba, novou požadovanou teplotu. Změna se potvrdí opětovným stisknutím kontrolního tlačítka. Po potvrzení se zobrazí nově požadovaná hodnota rychlým blikáním displeje, poté se zobrazí aktuální teplota externí cirkulační kapaliny.

Pravidelná údržba
Pravidelně kontrolujte stav a kvalitu kapaliny v rezervoáru. Pokud je třeba provést vyčištění, použijte kapalinu, která je shodná nebo kompatibilní s používanou cirkulační kapalinou.

Cirkulační chladicí kapalinu je třeba pravidelně obměňovat. Interval obměny závisí na stávajících podmínkách a stupni zatížení. Před výměnou cirkulační kapaliny se prosím ujistěte, že nemá nebezpečnou teplotu.

Nezbytnou nutností je pravidelné čištění žeber kondenzátoru pomocí vysavače. Interval čištění závisí na podmínkách. Výrobce doporučuje provádět vizuální kontrolu a případné čištění chladicích žeber kondenzátoru každý měsíc. Po čase se na základě zkušenosti stanoví optimální termín čištění, který je treba důsledně dodržovat.

Jednotky s PD čerpadly mají v okruhu cirkulační kapaliny zařazen filtr. Filtr má za úkol zachycovat mechanické nečistoty a zabránit tak poškození lopatek čerpadla. Zanesený filtr způsobí zvýšení tlaku cirkulační kapaliny.

Při prvním uvedení do provozu se může filtr snadno zanášet. **Po uplynutí jednoho týdne od uvedení do provozu je třeba filtr vyčistit.** Další kontrola a čištění filtru se doporučuje v měsíčních intervalech. Po několika mesících se na základe zkušenosti stanoví vhodný interval kontroly čistoty filtru. Před čištěním odpojte přívodní kabel od zdroje elektrické energie a vypustte z jednotky cirkulační kapalinu.

Forenklet bru kermanual

Innstalasjon

Kjøleren er ett luftkjølt system.
Luften går inn foran, og går ut på siden og bak kjøleren.
Plassèr derfor alltid kjøleren så det er god plass rundt.
Dårlig luftgjennomstrømning vil kunne forårsake dårlig kjølekapasitet og i verste fall kan det forårsake skader på kompressoren.

Kjøleren bør ikke plasseres i ekstremt skitne rom, og periodevis rengjøring må utføres.
Lag gjerne et skjema, og heng det nær kjøleren.
For at kjøleren skal virke ordentlig, trenger den stor luftgjennomstrømning i kondensator.
Når kondensatoren tettes med støv, eller det blir varmere enn 25°C i rommet, vil dette føre til tap av kjølekapasitet.

Kjøleren har full kjølekapasitet opp til 25°C (77°F) rom temperatur.

Vær sikker på at strøm, spenning møter de spesifiserte verdier ±10%.

Rørtilkoblinger er plassert bak på kjøleren og er påsatt propper for beskyttelse.
Størrelsen på rør tilkoblinger er ½" inch FPT gjenger
(¾" inch FPT gjenger for kjølere med CP 55 pumpe).
Ta bort plastikkpropper fra begge kuplingene, og tilkoble deretter rørene.
Ut fra kjøler til inntak på applikasjonen.
Inn på kjøler fra uttak på applikasjonen.

For å fylle systemet .
Åpne deksel for reservoar og skrukork på reservoaret.
Fyll opp med ren kjølevæske/vann.

For anbefalt kjølevæske, se side 24.

Operasjon

Før start av kjøleren, dobbelsjekk at alle elektriske og rørtilkoblinger er korrekt tilkoblet.
Kontrollèr at vannsystemet er fylt opp med anbefalt kjølevæske.
Sett på strømmen ved å slå på bryter på baksiden av kjøleren.

For å starte kjøleren,- trykk. For å slå av kjøleren,- trykk igjen.

LED lyset indikerer status på kjøleren. Den lyser når kjøleren fjerner varme fra vannet .
Når temperaturen nærmer seg settpunktet, begynner LED lyset å blinke.

Temperatur settpunkt justering.

For å programmere kontrolleren,- trykk på kontrolleren. Indikatorlampen vil nå lyse og nummerdisplayet blinke den satte sett-temperatur.
For å forandre verdien, trykk piltast opp eller ned til ønsket verdi blinker i displayet. Trykk igjen for å bekrefte den nye verdien.
Displayet vil nå blinke den nye verdien en liten stund og deretter gå tilbake til den avleste temperaturen.

Periodisk vedlikehold

Kontrollèr væskenivået i reservoaret periodisk.
Rengjør reservoaret ved behov.
Spyl reservoaret med rengjøringsmiddel som er kompatibelt med systemet og væske som skal brukes som kjølevæske.

Kjølevæsken i systemet bør skiftes med periodiske mellomrom.
Frekvensen på skifte beror på bruken av systemet.

Før kjølevæsken skiftes må, kjølevæske temperaturen være på ett sikkert nivå.

Periodisk rengjøring av kondensatoren er strengt nødvendig.
Anbefalt frekvens, kontrollèr kondensatoren en gang pr. mnd. etter installasjon.
Deretter rengjøres kondensatoren jevnlig med samme intervall.

Kjølere med PD pumper er utstyrt med sil. Dersom det er partikler i systemet , beskytter silen mot ødeleggelser.
Etter noe tid, bør man kontrollere/rengjøre dette filteret, deretter kontrollèr/rengjør filteret jevnlig.
Tett filter vil forårsake lavere trykk i sirkulasjons systemet.

Description

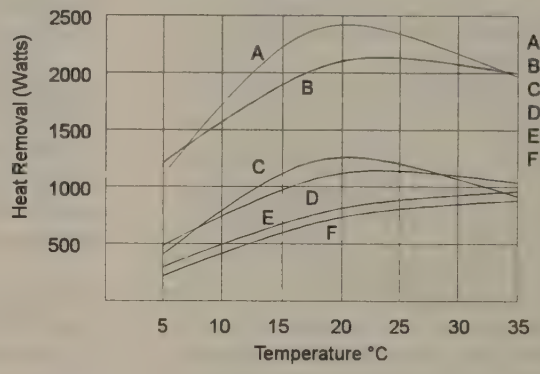
The Merlin Recirculating Chiller is designed to provide a continuous supply of cooling fluid at a constant temperature and volume. The unit consists of an air-cooled refrigeration system, plate heat exchanger, recirculating pump, polyethylene reservoir, and a microprocessor temperature controller.

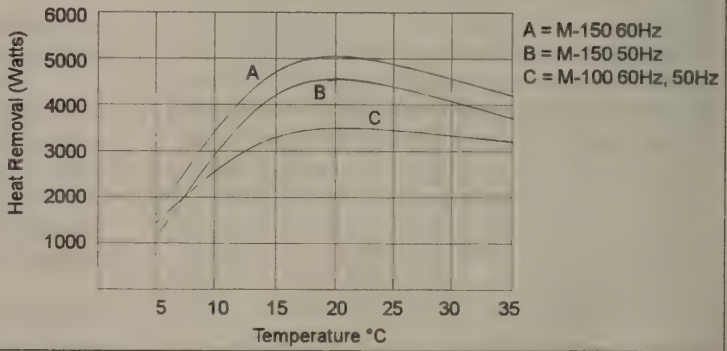
Throughout the manual, you will be asked to consult the unit's serial number label for specific information. The label is located on the rear of the unit.

Specifications

	M-25	M-33	M-75	M-100	M-150
Temperature Range[1,2]	+5°C to +35°C				
Temperature Stability[1,3,4]	±0.1°C		±0.15°C		
Reservoir Volume					
Gallons	0.5				
Liters	1.9				
Refrigerant[5]	R134a			R404a	

Cooling Capacity (Watts)[1,4]





1. Specifications subject to change.
2. Modified temperature ranges to either -15°C or to +90°C are available.
3. At the chiller. Display resolution 1.0°C. 0.1°C display resolution is available using the controller's Setup/Tuning Loop, see page 30.
4. Circulating water at 20°C ambient. Cooling capacity will vary depending on fluid temperature, ambient temperature, and cooling fluid.
5. Standard temperature range units.

Specifications

	M-25	M-33	M-75	M-100	M-150
Intake Requirements (ft^3/min) *(60 Hertz units)*	178	178	385	755	755
Shipping Weight					
(Pounds)	141	141	200	287[1]	287[1]
(Kilograms)	64	64	91	130	130

1. Units with PD-2 pumps. Units with CP-55 pumps weigh 310 pounds (141 kilograms).

Pump Options

Standard temperature range units

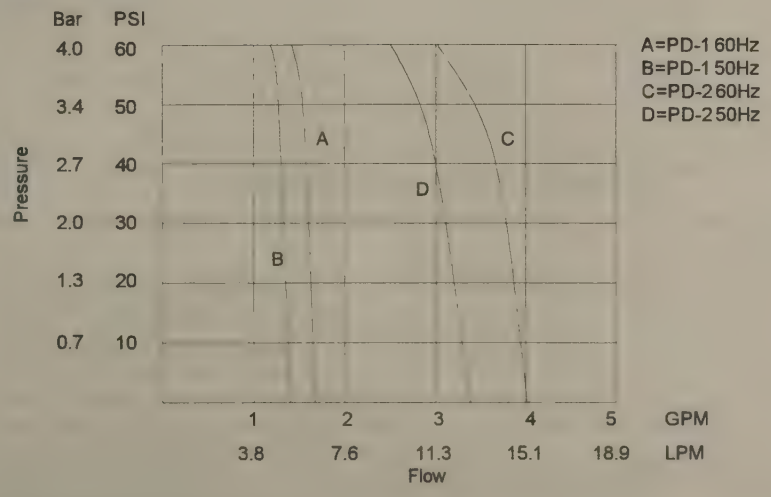
Unit	Standard	Optional
M-25	MD-30 or PD-1	None
M-33	MD-30 or PD-1	PD-2
M-75	PD-1	PD-2
M-100	PD-2	CP-55
M-150	PD-2	CP-55

High/Low temperature range units

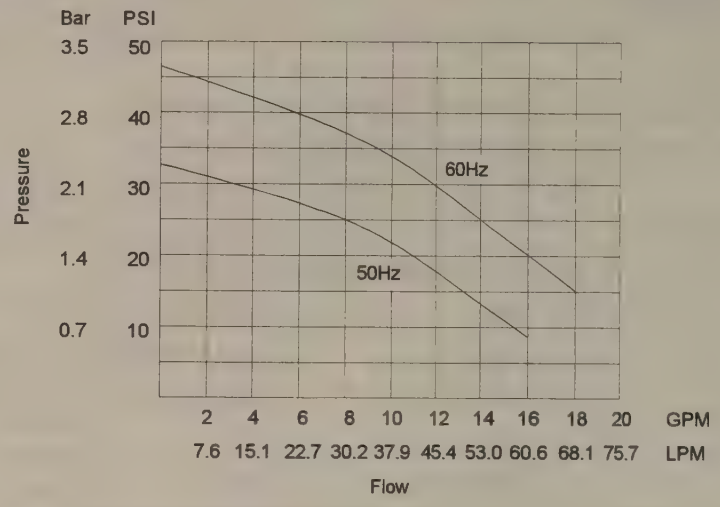
Unit	Standard	Optional
M-25	PD-1	None
M-33	PD-1	PD-2
M-75	PD-2	None
M-100	PD-2	CP-55
M-150	PD-2	CP-55

Pump Capacity

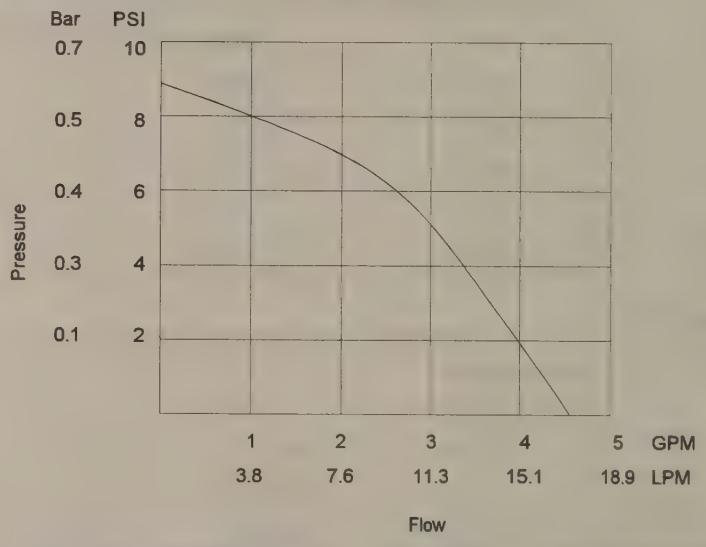
PD-1, PD-2



CP-55

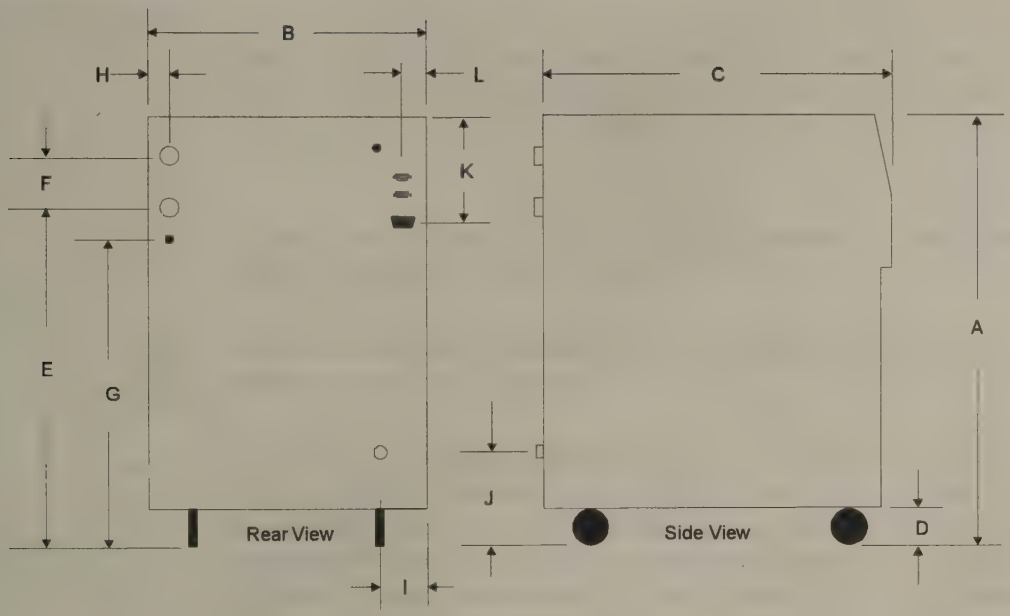


MD-30 (60 Hertz)[1]



1. The MD-30 is not available for 50 Hertz units.

Unit Dimensions (±1/8")



Unit Dimensions	M-25	M-33	M-75	M-100	M-150
Dimension A[1]	23 7/8	23 7/8	26 5/8	30 1/4	30 1/4
Dimension B[1]	12 5/8	12 5/8	16 1/4	21 1/4	21 1/4
Dimension C[1]	20 1/8	20 1/8	23 3/8	28 5/8	28 5/8
Dimension D[2]	2	2	2	3	3
Dimension E[3]	18 7/8	18 7/8	21 1/8	24 3/4	24 3/4
Dimension F[4]	3	3	3	3	3
Dimension G[5]	16 3/4	16 3/4	19 1/4	23	23
Dimension H[6]	3/4	3/4	2	1 1/2	1 1/2
Dimension I[7]	4 1/4	4 1/4	3 1/2	5	5
Dimension J	4	4	3	7 3/4	7 3/4
Dimension K	7 1/8	7 1/8	7 1/8	7 1/8	7 1/8
Dimension L	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
Crate Dimensions (H x W x D)[8]	36 x 18½ x 26	36 x 18½ x 26	39 x 22¼ x 29¼	42x 27 x 35¼	42 x 27 x 35¼

1. Dimension A is the height of the unit. Units with CP-55 pumps are 6" higher. The unit width and depth (dimensions B and C) are the case dimensions, add approximately 1/2 inch to include the plumbing connections.
2. Dimension D is the distance from the floor to the bottom of the unit case (height of the casters).
3. Dimension E is the distance from the floor to the center of the outlet connection.
4. Dimension F is the distance between the center of the outlet and inlet connections.
5. Dimension G is the distance from the floor to the center of the pressure relief valve (units with PD pumps).
6. Dimension H is the distance from the unit's side to the center of the outlet/inlet connections, and the pressure relief valve. 2" from the unit's side to the center of the outlet/inlet connections for M-100/150 units with CP-55 pumps.
7. Dimension I is the distance from the unit's side to the center of the drain connection. 5 1/8" for M-100/150 units with CP-55 pumps.
8. Dimension J is the distance from the floor to the center of the drain connection. 7 3/8" for M-100/150 units with CP-55 pumps.
9. Dimension K is the distance from the top of the unit to the center of the power connection.
10. Dimension L is the distance from the unit's side to the center of the power connection. NA for M-100/150 units rated 400V/50Hz.

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Section III Installation and Operation

Site

The unit is designed for indoor use only. It should be located in a clean industrial environment where ambient temperatures are inside the range of 10°C to 35°C (50°F to 94°F) and relative humidity between 10% to 80%, noncondensing.

Operating altitude is sea level to 6000 feet (1830 meters). The unit's over-voltage category is II, its pollution degree is 2.

Never place the unit in a location where excessive heat, moisture, or corrosive materials are present.

The unit has an air-cooled refrigeration system. Air is drawn through the front of the unit and discharged through rear and side panels. The unit must be positioned so the intake and discharge are not impeded. A minimum clearance of 3 feet (1 meter) on all vented sides is necessary for adequate ventilation. Inadequate ventilation will cause a reduction in cooling capacity and, in extreme cases, compressor failure.

Excessively dusty areas should be avoided and a periodic cleaning schedule should be instituted (see Section IV, Maintenance and Service). Optional air filters are available, contact our Service Department. See Preface, After-Sale Support.

The unit retains its full rated capacity in ambient temperatures up to approximately 25°C (77°F). Reduce the cooling capacity 1% for every 0.5°C (1°F) above 25°C (77°F), up to a maximum ambient temperature of 35°C (94°F).

Direction of Air Flow

Electrical Requirements

The unit construction provides extra protection against the risk of electrical shock by grounding appropriate metal parts. The extra protection may not function unless the power cord is connected to a properly grounded outlet. It is the user's responsibility to assure a proper ground connection is provided.

The following two pages list the available power options.

Standard and Low-Temperature 60 Hertz Units				
Unit	**Pump**	**Voltage**	**Current Value**	**Line Cord Plug**
M-25	MD-30	115	8.1	5-15P
	PD-1	115	9.8	5-15P
M-33	MD-30	115	11.5	5-20P
	PD-1	115	13.2	5-20P
	PD-2	115	15.5	5-20P
	PD-1	208/230	6.5	6-15P
	PD-2	208/230	7.8	6-15P
M-75	PD-1	208/230	8.8	6-16P
	PD-2	208/230	10.1	6-15P
M-100	PD-2	208/230	13.1	L6-30P
	CP-55	208/230	16.1	L6-30P
M-150	PD-2	208/230	15.4	L6-30P
	CP-55	208/230	18.4	L6-30P

High-Temperature 60 Hertz Units				
Unit	**Pump**	**Voltage**	**Current Value**	**Line Cord Plug**
M-25	PD-1	115	14.7	5-20P
M-33	PD-1	115	16.8	5-20P
	PD-2	115	19.1	5-20P
	PD-1	208/230	8.5	6-15P
	PD-2	208/230	9.8	6-15P
M-75	PD-2	208/230	11.4	6-15P
M-100	PD-2	208/230	13.5	L6-30P
	CP-55	208/230	16.5	L6-30P
M-150	PD-2	208/230	13.5	L6-30P
	CP-55	208/230	16.5	L6-30P

NOTE: All 60 Hertz units are UL Listed and Certified to Canadian Standards.

Standard and Low-Temperature 50 Hertz Units				
Unit	**Pump**	**Voltage**	**Current Value**	**Line Cord Plug**
M-25	PD-1	230	5.1	Country Specific
M-33	PD-1	230	6.3	Country Specific
	PD-2	230	7.6	Country Specific
M-75	PD-1	230	8.8	Country Specific
	PD-2	230	10.1	Country Specific
M-100	PD-2	400/3Ø/5W	7.7	NA
	CP-55	400/3Ø/5W	5.5	NA
M-150	PD-2	400/3Ø/5W	7.7	NA
	CP-55	400/3Ø/5W	5.5	NA

High-Temperature 50 Hertz Units				
Unit	**Pump**	**Voltage**	**Current Value**	**Line Cord Plug**
M-25	PD-1	230	7.8	CountrySpecific
M-33	PD-1	230	8.6	CountrySpecific
	PD-2	230	9.9	CountrySpecific
M-75	PD-2	230	11.7	CountrySpecific
M-100	PD-2	400/3Ø/5W	10.2	NA
	CP-55	400/3Ø/5W	8.0	NA
M-150	PD-2	400/3Ø/5W	10.2	NA
	CP-55	400/3Ø/5W	8.0	NA

Amperage based on extreme operating conditions. Operating in a 20°C ambient and at nominal voltage will result in a lower amperage draw.

Refer to the serial number label on the rear of the unit for specific electrical requirements.

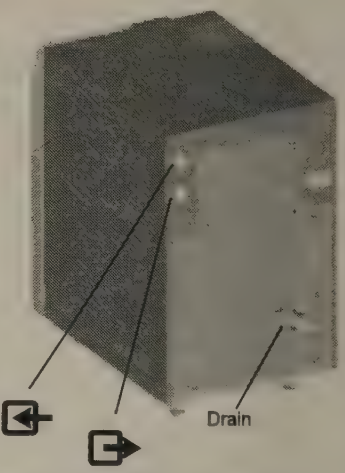
NOTE: Three-phase units are not supplied with a line cord. Instructions for wiring three-phase units are located behind the power box cover. To access the power box remove the unit's top and left-side panel. Revove the screws securing the cover.

Plumbing Requirements

The plumbing connections are located on the rear of the unit and are labelled (supply) and (return). The connections are ½ inch Female Pipe Thread. For units with CP-55 pumps, the connections are ¾ inch Female Pipe Thread. Units with ½ inch fittings are supplied with ⅜ inch and ½ inch barbed adapters, units with ¾ inch fittings are supplied with ½ inch and ¾ inch barbed adapters.

Remove the plastic protective plugs from both plumbing connections. Install the barbed adapters to these connections.

Connect to the hose feeding the inlet of your application. Connect to the hose from the outlet of your application. Clamp all connections.



Never connect the fittings to your building water supply or any water pressure source.

NOTE: On units equipped with PD pumps, ensure your plumbing is rated to withstand 85 psi at the highest operating temperature.

It is important to keep the distance between the unit and the instrument being cooled as short as possible. Tubing should be straight and without bends. If diameter reductions must be made, they should be made at the inlet and outlet of your application, not at the chiller.

All units have a ball-valve reservoir drain located on the rear of the unit. Add the desired length of tubing to the drain valve. To help prevent any spillage from your application, consider installing external isolation valves on the supply and return lines.

Fluids

Never use flammable or corrosive fluids with this unit. Do not use automotive antifreeze. Commercial antifreeze contains silicates that can damage the pump seals. Use of automotive antifreeze will void the manufacturer's warranty.

Acceptable fluids and their normal operating temperature ranges are:

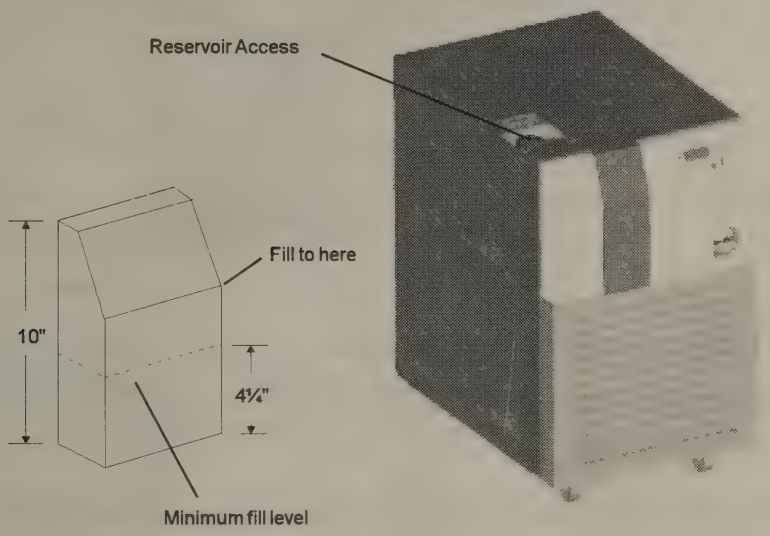
- Filtered/Single Distilled water, +5°C to +85°C
- 50/50 Uninhibited Ethylene Glycol/Water, -15°C to +60°C
- 50/50 Inhibited Ethylene Glycol/Water, -15°C to +90°C
- 50/50 Uninhibited Propylene Glycol/Water, -15°C to +60°C
- 50/50 Inhibited Propylene Glycol/Water, -15°C to +90°C
- Deionized water (1 - 3 megohm, compensated), +5°C to +85°C

Refer to Appendix A, Water Quality and Standards, for additional information.

Filling Requirements

The polyethylene reservoir is translucent for easy fluid level monitoring. Remove the reservoir access panel. Locate and remove the reservoir cap. Fill the reservoir with clean cooling fluid, see previous page.

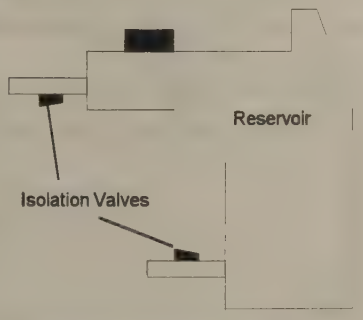
Since the reservoir capacity may be small compared to your application, have extra cooling fluid on hand to keep the system topped off when external circulation is started.



Reservoir Tank Isolation Valves/ Open Tank Circulation

Units are equipped with two reservoir tank isolation valves. The valves are used to isolate the tank from the fluid flow to enable circulation to an open system or tank. The units are factory shipped with the valves open.

Ensure the valves are open when circulating to a closed system.



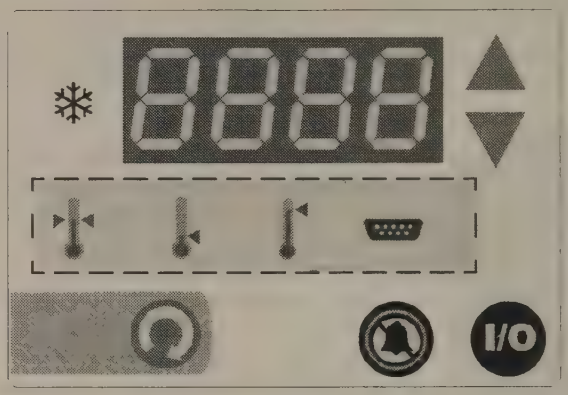
Upper Left Side of Unit, Panel Removed

System temperature changes with the isolation valves closed, and while circulating to a closed system, can create a vacuum and/or high pressure conditions.

If your application requires the process fluid to flow to an open tank above the unit, before starting close the valves to prevent fluid siphoning and reservoir overflow. To close the valves you must remove the top and side access panels.

Controller

The controller controls temperature using a Proportional-Integral-Derivative (PID) algorithm. It is designed with self-diagnostic features and easy to use operator interface.



Controller

Use this key to toggle the **unit on or off**.

Use this key to **scroll** through the controller's LEDs. It is also used to accept and save changes.

If the alarm sounds, use this key to toggle the **alarm off and on**.

NOTE: If the cause of the alarm is cleared but then reoccurs, the alarm will sound again.

Use this key to **increase displayed numerical values**.

Use this key to **decrease displayed numerical values**.

Indicates **refrigeration system status**. It illuminates to indicate the refrigeration system is removing heat from the cooling fluid. As the operating temperature approaches the temperature setpoint, the LED will flash. The indicator is off when heat is not being removed.

NOTE: The following indications are not visible until is depressed.

Indicates the controller is displaying the **setpoint**. Adjust the display value using the arrow keys.

NOTE: You cannot adjust the setpoint closer than 2°C to either of the temperature limits discussed below.

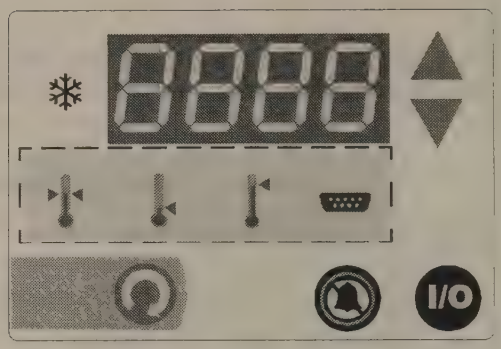
Indicates the controller is displaying the **low temperature alarm** setting. The indicator flashes and the alarm sounds if this limit is exceeded. Adjust the display value using the arrow keys.

Indicates the controller is displaying the **high temperature alarm** setting. The indicator flashes and the alarm sounds if this limit is exceeded. Adjust the display value using the arrow keys.

(Optional) Indicates the unit is in the **remote/serial communication** mode of operation. The indicator flashes if the unit is in the remote start/stop mode of operation. Toggle between the local and remote modes using the arrow keys.

NOTE: For all four indicators, if neither arrow key is pressed within 10 seconds the display will return to the recirculating temperature display. Save any change using . After pressing an arrow key, if is not pressed within 60 seconds the display will return to the recirculating temperature display and ignore any change.

Start Up/Shut Down



Controller

Pre-Start Before starting the unit, double check all electrical and plumbing connections. Have extra recirculating fluid on hand. If the unit will not start refer to Section VI Troubleshooting.

Circuit Breaker Place the circuit breaker located on the rear of the unit to the up position, the controller will flash and the alarm will momentarily sound.

The unit has automatic restart. If the unit was shutdown as a result of a power failure and power is restored, it will restart. If it was shut down using the circuit breaker, placing the circuit breaker up will restart the unit.

Starting Press I/O. The controller will do a self-test (the controller will quickly sequence through its LEDs and momentarily sound the alarm) and then display the recirculating fluid temperature. The refrigeration system and the recirculation pump will then start. The RECIRCULATING PRESSURE gauge will display the pump operating pressure. If the pressure needs adjusting, refer to page 38.

NOTE: If on start up the unit's recirculating fluid is outside either temperature limit, the unit will operate but the appropriate indicator will flash until the fluid is within the limit.

Setpoint To display/change the setpoint press ◉ until illuminates. The display will flash the current setpoint value. Use the arrow keys to change the value.

NOTE: If the arrow keys are not pressed within 10 seconds the display will return to the current reservoir temperature. The controller will not allow you to enter a setpoint closer than 2°C of either temperature alarm setting discussed on the next page. Trying to use a setpoint within 2°C causes the appropriate indicator to flash and sounds the audible alarm twice.

Once the desired setpoint is displayed, press ◉ again to confirm the change. The display will rapidly flash the new value for a short period and then return to the recirculating fluid temperature.

NOTE: If the new value is not confirmed within 60 seconds the display will return to the recirculating fluid temperature and ignore any changes.

Low Temp Alarm

To display/change the low temperature alarm setting press ◉ until illuminates. The display will flash the current limit value. Use the arrow keys to change the value. The range is 0°C (-15°C for low-temp units) to 30°C.

NOTE: If the arrow keys are not pressed within 10 seconds the display will return to the current reservoir temperature.

Once the desired setting is displayed, press ◉ again to confirm the change. The display will rapidly flash the new value for a short period and then return to the recirculating fluid temperature. See Error Codes on page 35.

NOTE: If the new value is not confirmed within 60 seconds the display will return to the recirculating fluid temperature and ignore any changes.

High Temp Alarm

To display/change the high temperature alarm setting press ◉ until illuminates. The display will flash the current setting value. Use the arrow keys to change the value. The range is 10°C to 40°C (90°C for high-temp units).

NOTE: If the arrow keys are not pressed within 10 seconds the display will return to the current reservoir temperature.

Once the desired limit is displayed, press ◉ again to confirm the change. The display will rapidly flash the new value for a short period and then return to the recirculating fluid temperature. See Error Codes on page 35.

NOTE: If the new value is not confirmed within 60 seconds the display will return to the recirculating fluid temperature and ignore any changes.

Remote/Serial Comm

(Optional) To enable or disable remote operation or serial communication press ◉ until illuminates. The display will flash the communication status. Use the up arrow key to enable, the down arrow to disable.

NOTE: If the arrow keys are not pressed within 10 seconds the display will return to the current reservoir temperature.

Once the desired status is displayed, press ◉ again to confirm the change. The display will rapidly flash the new status for a short period and then return to the recirculating fluid temperature.

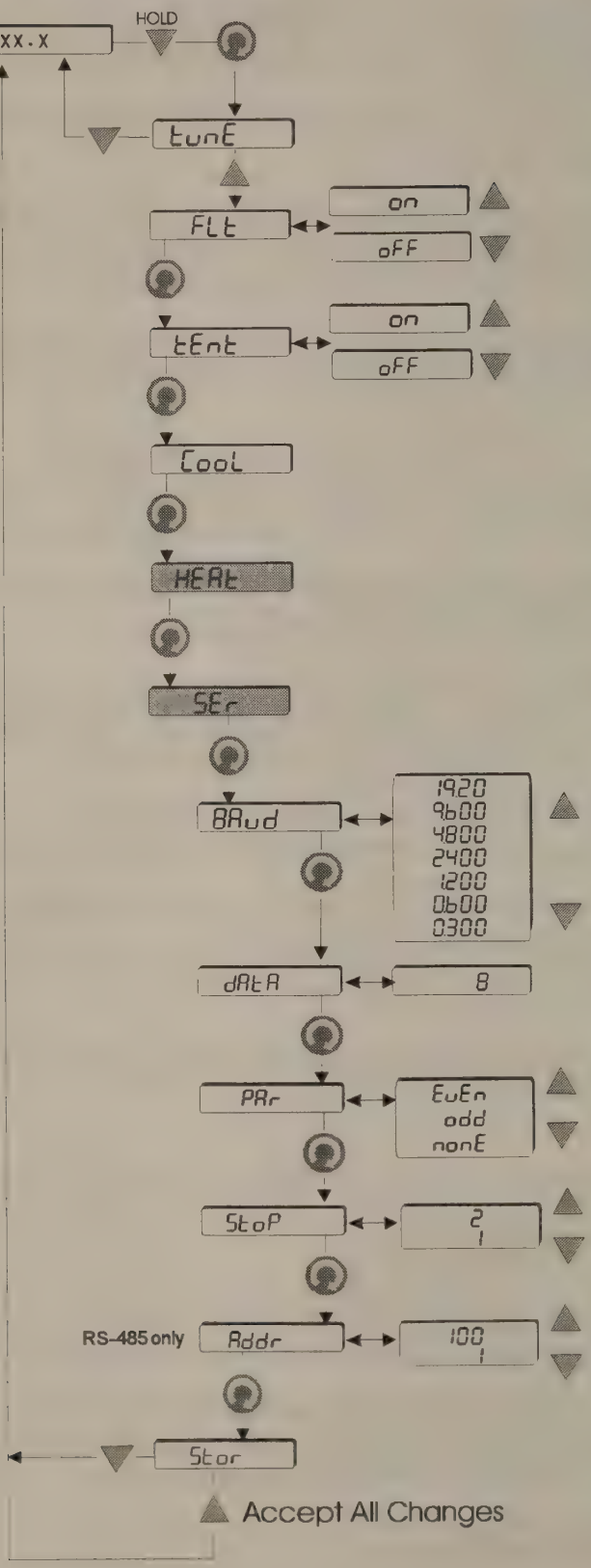
NOTE: If the new status is not confirmed within 60 seconds the display will return to the recirculating fluid temperature and ignore any change.

NOTE: Enabling serial communications disables the remote start/stop feature, see page 28. In either mode, the setpoint and alarm values can not be changed using the controller but they can still be viewed.

Stopping

To turn the unit off, press I/O.

Setup/Tuning Loop



The Setup/Tuning Loop is used to configure the controller temperature display and various operating parameters. To enter the loop you must be displaying the reservoir fluid temperature and then, while pressing and holding ▼, press ◉. The display will indicate tunE. Use the arrow keys to enter/bypass the loop. Once in the loop press ◉ to sequence through it. Use the arrow keys to change any display.

The loop is used to determine how the unit will react when a fault occurs (FLt) — either shut down (on) or continue to run (oFF). The unit is shipped configured to run.

It is also used to configure the temperature displays to indicate to a tenth of a degree (tEnt).

The loop can also be used to set the controller's PID parameters (Cool HEAt). The Thermo NESLAB factory preset values are:

COOL	P	I	D
STD TEMP UNITS	20	0.5	0.0
LOW TEMP UNITS	12	0.5	0.0
HIGH TEMP UNITS	7	0.5	0.0
HEAT			
ALL UNITS	5	0.5	0.0

Thermo NESLAB recommends that only a qualified technician change PID parameters. Incorrect PID values will hamper unit performance.

The heat PID is only applicable to units configured with a heater.

The loop is also used to adjust/verify serial communication parameters (SEr). This section of the loop is applicable only to units configured for serial communications capability.

Changes made in the Tuning/Setup Loop take affect when ▲ is pressed at the Stor prompt. Pressing ▼ at the prompt aborts *all* changes.

Section IV Options

Communication Connector

A female 9-pin D-connector is located on the rear of the unit. The connector is used for either RS-232 or RS-485 serial communication (see Appendix B or C).

When the unit is configured for serial communication the LED on the controller is illuminated. If the unit is shut off while still configured for serial communication, the temperature display will go blank, but the LED will still be illuminated.

When the unit is configured for serial communication the unit can be stopped using the local controller. To restart, send another start command.

NOTE: If you need to start the unit using the local controller, simultaneously depress and hold both arrow keys for approximately 10 seconds. The display will show the temperature, and the alarm will sound. Use and scroll to the LED and turn it OFF. The unit can now be started and operated from the keypad.

RS-232 (J-102) COMM

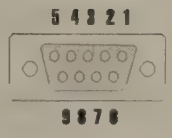
Pin #	Function
1	No connection
2	TX
3	RX
4	No connection
5	GND = Signal ground
6	No connection
7	No connection
8	No connection
9	No connection

RS-485 (J-103) COMM

Pin #	Function
1	No connection
2	No connection
3	No connection
4	No connection
5	No connection
6	No connection
7	No connection
8	TX
9	RX

TX = Transmitted data from controller
RX = Received data to controller.

Hardware **Mating Connector**
AMP Part# 745492-2 or equivalent



Remote Start/Stop

A male 9-pin D-connector is located on the rear of the unit. The connector is used for either 12 - 24VAC or 12 - 24VDC remote start/stop; and as a status relay dry contact.

To start the unit from a remote location apply the correct voltage to pins 6 & 8. When the unit is started by a remote start/stop voltage on the controller will flash.

Once started remotely, stop the unit by removing the applied voltage from pins 6 & 8 or by pressing I/O on the local controller. To restart remotely after stopping locally, remove and reapply the remote start voltage to J101.

NOTES:

Enabling serial communications disables the remote start/stop feature.

Should the unit experience a high/low temperature warning/fault, a reservoir level warning/fault, or a low pump flow warning/fault, the status relay will de-energize.

(J-101) COMM Pin Connection

Pin #	Function		
1	No Connection	6	Remote On +
2	Status, NO	7	RTD2B
3	Status, NC	8	Remote On -
4	RTD2A	9	No Connection
5	Status, Common		

Hardware **Mating Connector**
AMP Part# 745491-2 or equivalent

Remote Start Input:

12 to 24 Volts DC ±10% maximum input current, 9ma.

12 to 24 Volts AC ±10% maximum input current, 5ma.

Absolute maximum input voltages:

40 volts rms. continuous.

56 volts peak.

Rating for both normally open and normally closed status relay contacts are:
Maximum rated load - 1.0 Amp, 24 Volts AC/DC, resistive.

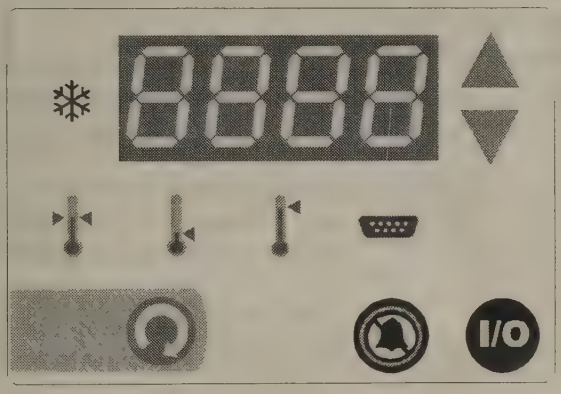
Minimum permissible load - 1 ma @ 5 VDC.

External Temperature Sensor

Connect the external sensor to the male 9-pin D-connector located on the rear of the unit.

The external temperature sensor is enabled using the controller. With the controller displaying the temperature press (P) five times. The display will alternate with rPrb and either on or oFF. If desired, use the arrow keys to change the status and then press (P) to return to the temperature display.

If the external sensor is selected the controller will display the temperature at the external sensor. Also, the controller indicates the external sensor is selected by flashing the left-most temperature decimal point.



The controller continues to use the existing setpoint. When using the external sensor the controller will not allow internal unit temperatures outside 3°C to 37°C for standard temperature range units, -17°C to 37°C for low-temperature range units, and 3°C to 92°C for high-temperature range units.

The selected sensor is retained by the controller if it is turned off, or if power is removed.

If there is an external sensor error the unit will automatically return to the internal sensor. An error code will flash and if the fault mode is on the unit will shut down. See Error Codes on page 35. Press I/O to restart the unit.

NOTE: If you need to monitor status while using the external sensor, an optional Y-connector cable is available from Thermo NESLAB.

Warning/Fault

NOTE: This is a standard feature for high-temperature units.

Should the reservoir fluid level drop below normal the mutable alarm will sound, the status relay will de-energize, an error message will be displayed, and, depending on the unit's configuration, the unit will continue to run or shut down. Refill the reservoir and, if necessary, restart the unit.

The unit will not start without any fluid in the reservoir regardless of how it is configured.

The unit is configured to run or shut down using the controller's Setup/Tuning Loop on page 30.

Low Pump Flow Warning/Fault

NOTE: This is a standard feature for high-temperature units.

Should the pump flow drop below 0.25 gpm (1.0 gpm for units with a CP-55 pump) the mutable alarm will sound, the status relay will de-energize, an error message will be displayed, and, depending on the unit's configuration, the unit will continue to run or shut down.

Once the cause of the low flow is identified and corrected restart the unit, if necessary.

The unit is configured to run or shut down using the controller's Setup/Tuning Loop, see page 30.

Additional Accessories

External Filtration Package
A partial flow liquid filter available in 5, 10, 25, and 40 micron filter sizes.

External DEI Package
Partial flow DEI package will maintain between 1 and 3 megohm/cm^2 water resistivity. A cartridge indicator lets you know when the filter needs changing.

Condenser Air Filter
An easy to install air filter protects the condenser in dusty environments.

Section V Maintenance and Service

Error Codes

On Start Up:

Er00 ROM checksum. Clear with key.

Er01 Test failure. Locks up the program.

Er02 Display board failure. Clears when display board is fixed.

Er03 Critical checksum failure. Clear with key.

Er 14 Synchronous comm

Er 15 Asynchronous comm

Er 16 Bad calibration data

Unusual Hardware Conditions

These errors will flash on the display and cannot be cleared. These are internal controller problems.

Er04 through Er 13 - Interrupt errors during runtime.

ConF BOM invalid

Functional/ Machine errors

These errors will clear themselves once the problem disappears.

Error Display	Indication
Lot	Low temp setpoint warning/fault
Add	Low level warning, fluid below minimum fill level, see page 25
H it	High temp setpoint warning/fault
Er25	Shorted RTD1
Er26	Open RTD1
LoFL	Low process flow warning/fault
LLF	Fluid low level fault - unit shuts down
Er50	Low flow to heat exchanger fault - unit shuts down

Unit reaction to warning/fault errors depend on how the unit is configured, see Setup/Tuning Loop on page 30. The unit is shipped configured to continue running. If any other code appears contact Thermo NESLAB customer service.

Displaying Software Version Number

The controller can display the installed software version number. For example, for a unit with software version **026950.1A**:

1. Unit is running normally and displaying recirculating fluid temperature.
2. Press and hold ▼ for at least 10 seconds. The display will show the first two digits, for example: 02 .
3. Press ◉
   The display will show the remaining digits to the left of the decimal, for example: 6950.
4. Press ◉
   The display will show the decimal point and the digit to the right of the decimal point, for example, .1 .
5. Press ◉
   The display will show the revision letter, as its equivalent number, for example, 1 = A.
6. Press ◉
   Disregard this display.
7. Press ◉
   The display returns to the recirculating fluid temperature.

Cleaning

Reservoir

Periodically inspect the fluid inside the reservoir. If cleaning is necessary, flush the reservoir with a cleaning fluid compatible with the circulating system and the cooling fluid.

The cooling fluid should be replaced periodically. Replacement frequency depends on the operating environment and amount of usage.

Before changing the cooling fluid ensure it is at a safe handling temperature.

NOTE: It will be necessary to use a wet-vac or siphon to completely drain the reservoir. Use care so as not to damage the reservoir float switch.

See page 25, Filling Requirements, for instructions on cooling fluid replacement.

Condenser

For proper operation, the unit needs to pull substantial amounts of air through a condenser. A build up of dust or debris on the fins of the condenser will lead to a loss of cooling capacity. Optional air filters are available, contact our Service Department. See Preface, After-Sale Support.

The lower front of the unit has a one-piece grille assembly. Using your hands gently pry the assembly off. Use care not to scratch the paint.

Periodic vacuuming of the condenser fins is necessary. The cleaning frequency depends on the operating environment. After initial installation we recommend a monthly visual inspection of the condenser. After several months, the cleaning frequency will be established.

Use care cleaning the condenser fins, they can be easily bent.

Algae

To restrict the growth of algae in the reservoir, we recommend keeping the reservoir cover in place and using opaque circulation lines. This will eliminate the entrance of light required for the growth of most common algae.

Thermo NESLAB recommends the use of Chloramine-T, 1 gram per 3.5 liters. Other algaecides can be harmful to the unit's internal components. Contact Thermo NESLAB for additional information.

Leaks

A very small leak between the pump and motor is normal. If this is a new pump, allow it to run for 24 hours and reinspect. A continuous leak will require pump replacement.

Phase Rotation Interlock

Three phase units have a rotation interlock which prevents the unit from starting if the phase rotation is wrong. If the unit will not start, see Section VII, Troubleshooting. If the options in the checklist are not applicable, the problem may be phase rotation.

The interlock is located in the power box. Remove the unit's top and left-side panel to access it. The interlock has a green light which illuminates when the phase is correct.

If the phase is incorrect, disconnect the unit from its power source. Reverse any two line conductors on the line side of the main circuit breaker.

Never remove the green ground wire.

Reconnect the unit to its power source. If the unit will not start, contact our Service Department.

PD Pressure Relief Valve

Units with PD pumps have a Pressure Relief Valve. Refer to the serial tag label on the rear of the unit and the BOM decoder on page 40 to identify the type of pump. The valve is used to adjust the unit's fluid flow/pressure.

NOTE: The valve is factory preset for the most common applications and normally requires no further adjustment. Also, the unit's pump is factory preset not to exceed 80±5 psi (550±1 kPa).

Before adjusting the valve turn the unit off. Locate the circular relief valve opening on the rear of the unit.

Turn the threaded stem fully clockwise.

If the unit is not plumbed to an application, install a loop of hose equipped with a shut-off valve between the supply and return fittings.

Turn the unit on.

Use the pressure gauge to read the relief valve setting.

Back out the threaded stem on the relief valve counterclockwise. Continue until the gauge indicates 80 psi (550 kPa) or the desired setting.

NOTE: The relief valve may drip if the threaded stem is backed out too far.

PD Pump Strainer

Units with PD pumps have a strainer. Refer to the serial tag label on the rear of the unit and the BOM decoder on page 40 to identify the type of pump.

If debris is in the system, the strainer will prevent the material from being drawn into the pump and damaging the pump vanes. A clogged strainer will also cause increased discharge pump pressures.

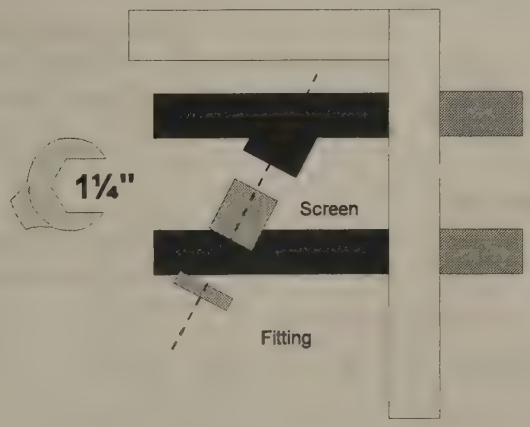
After initial installation, the strainer may become clogged with debris and scale. Therefore, **the strainer must be cleaned after the first week of installation**. After this first cleaning, we recommend a monthly visual inspection. After several months, the cleaning frequency will be established.

Before cleaning the strainer ensure the cooling fluid it is at a safe handling temperature. Disconnect the power cord from the power source and drain the unit.

PD pumps have a strainer located in the pump suction line. The strainer is located behind the right-side panel.

Remove the panel from the unit. Use one wrench to support the filter housing, and a second wrench to unscrew the 1¼ inch fitting. Remove the screen.

Clean the screen by rinsing it with water. When the screen is clean, replace it in the strainer, tighten the fitting and replace the panel. Refer to Section III for instructions on replacing the cooling fluid.

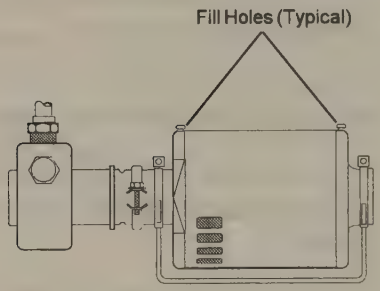


Right-side view

PD Pump Motor Lubrication

Some PD pumps use sleeve type bearings with large reservoirs. Oiling instructions are generally posted on each motor. In the absence of instructions, add approximately 30 to 35 drops of SAE 20 non-detergent oil to each bearing on the following schedule (SAE 20 = 142 CS viscosity):

Duty Cycle	Oiling Frequency
Continuous	Once every year
Intermittent	Once every 2 years
Occasional	Once every 5 years



Storage

If the unit is to be transported and/or stored in cold temperatures it needs to be drained. If the unit is to be transported and/or stored in cold temperatures it needs to be drained and then flushed with a 50/50 glycol/water mixture.

BOM Decoder

The Bill of Material (BOM) number helps identify the configuration of your unit. The number is printed on the label located on the rear of the unit.

Digit# 1 2 3 4 5 6 7 8 9 10 11 12

Unit Identifier
262 = M25
263 = M33
264 = M75
265 = M100
266 = M150

Temp Range
1 = Standard
2 = Low Temp
3 = High Temp

Voltage
02 = 100/60
12 = 115/60 100/50
16 = 200/230/60 200/50
25 = 230/50
26 = 400/50 5-wire

Pump
02 = CP-55
03 = PD-1
04 = PD-2
15 = MD-30

Options
0 = None
1 = LL/LF
2 = RS-232 & Rmt Start
3 = RS-485 & Rmt Start
4 = LL/LF, RS-232 & Rmt Start
5 = LL/LF, RS-485 & Rmt Start

Reserved
000

External Sensor Calibration

When using any external sensor for the first time, Thermo NESLAB recommends a two-point calibration. This calibration will only affect the temperature read by the external sensor.

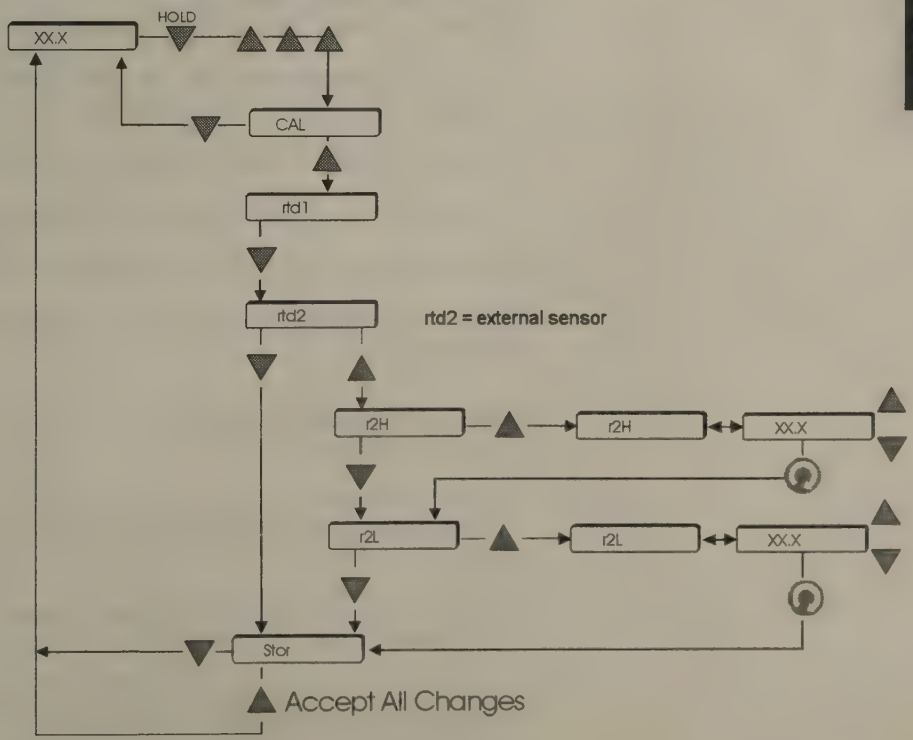
Enter the Calibration Loop by pressing and holding ▼ and then pressing the ▲ three times. The display will read CAL. Press ▲ and the display will read rtd1, then press ▼ and the display will read rtd2.

To calibrate the high-end temperature press ▲ and the display will read r2H. Press ▲ again and the display will flash between r2H and the current probe temperature.

Place the external sensor and a calibrated reference thermometer in a source containing fluid that is just below the high-end temperature range of the unit. Use ▲ and ▼ to adjust the temperature display to match the reference thermometer.

Once the display temperature matches the reference thermometer press ◉. Press ◉ until Stor is displayed, pressing ▲ accepts the new value.

Repeat for the low-end temperature, r2L. Use a fluid that is just above the low-end temperature range of the unit.



Section VI Troubleshooting

Checklist

Unit will not start

Check the line cord; ensure it is plugged in.

Check the position of the circuit breaker on the rear of the unit.

Check the controller for error codes, see page 35.

NOTE: On units with a Low Flow Switch and configured to shut down with a low flow fault (LoFL), several starting attempts may be necessary.

On units with a Reservoir Level Switch check the reservoir level.

Optional serial communications or remote start/stop enabled.

Make sure power source voltage is within the unit rated voltage ±10%.

400 Volt, 50 Hertz units are equipped with a phase monitor. Ensure proper phase to the unit. See Phase Rotation Interlock on page 38.

If is lit, the unit was shut off using serial communications. Start the unit using serial communications. To start the unit using the local controller press and hold both arrow keys for 10 seconds, the controller will power. Turn serial communications off using the procedure on page 23, and then press I/O to turn off the controller. Press I/O again to start the unit.

Unit will not circulate fluid

Check the reservoir level. Fill, if necessary.

Check the position of the reservoir tank valves. See Reservoir Tank Isolation Valves/Open Tank Circulation.

Check the instrument being cooled for restrictions in the cooling line.

Check the pump strainer (units with PD pumps).

The pump motor may be too hot. Allow it to cool.

Check the pressure gauge, adjust the relief valve as necessary (units with PD pumps).

Inadequate temperature control

Verify the setpoint.

If the temperature continues to rise, make sure your application's heat load does not exceed the rated specification, see Section II, Specifications.

Make sure the air intake and discharge are not impeded and the ambient temperature does not exceed +35°C.

Make sure the condenser is free of dust and debris, see Section V, Maintenance and Cleaning.

Verify the controller's PID values, see Setup/Tuning Loop.

Unit runs loudly

Check the position of the reservoir tank valves. See Reservoir Tank Isolation Valves/Open Tank Circulation.

No serial communications (optional)

All units are tested for serial communications before they leave the factory. Check the controller, ensure serial communication is enabled.

Check all communications commands, they *must be exact*. See Appendix B or C.

Check all wiring for proper connections or possible shorts.

Software to verify serial communication is available from Thermo NESLAB.

Service Assistance

If, after following these troubleshooting steps, your unit fails to operate properly, contact our Service Department for assistance (see Preface, After-sale Support). Before calling, *please* obtain the following information:

- *unit BOM number*
- *unit serial number*
- *software version*
- *voltage of power source*

Appendix A Water Quality Standard and Recommendations

	Permissible (PPM)	Desirable (PPM)
Microbiologicals		
(algae, bacteria, fungi)	0	0
Inorganic Chemicals		
Calcium	<40	0.6
Chloride	250	<25
Copper	1.3	1.0
Iron	0.3	<0.1
Lead	0.015	0
Magnesium	<12	0.1
Manganese	0.05	<0.03
Nitrates\Nitrites	10 as N	0
Potassium	<20	0.3
Silicate	25	<1.0
Sodium	<20	0.3
Sulfate	250	<50
Hardness	17	<0.05
Total Dissolved Solids	50	10
Other Parameters		
pH	6.5-8.5	7-8
Resistivity	0.01*	0.05-0.1*

* Megohm-Cm (Compensated to 25°C)

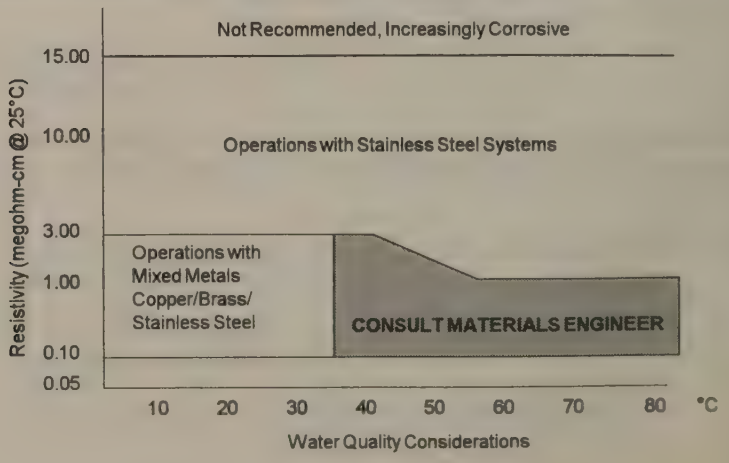
Unfavorably high total ionized solids (TIS) can accelerate the rate of galvanic corrosion. These contaminants can function as electrolytes which increase the potential for galvanic cell corrosion and lead to localized corrosion such as pitting which can be observed at the studs and on the outside surface of cooling coils. Eventually, the pitting will become so extensive that the coil will leak refrigerant into the water reservoir.

For example, raw water in the U.S. averages 171 ppm (of NaCl). The recommended level for use in a water system is between 0.5 to 5.0 ppm (of NaCl).

Recommendation: Initially fill the tank with distilled/deionized water. Do not use untreated tap water as the total ionized solids level may be too high.

Maintain this water quality at a resistivity of between 1 to 10 megohm-cm (compensated to 25°C) by using a purification system. Although the initial fill may be as high as 10 megohm-cm (compensated to 25°C), the desired level for long time usage is 1 to 3 megohm-cm (compensated to 25°C).

The above two recommendations will reduce the electrolytic potential of the water and prevent or reduce the galvanic corrosion observed.



Merlin Compatibility with Recommended Fluids

Filtered/Singled Distilled water, +5°C to +85°C
This fluid is recommended primarily because it has all microorganisms that cause biological fouling removed through vaporizing and condensing the water. However, distilled water does not remain pure for very long when exposed to the atmosphere. Air-born spores can contaminate the water and activate alga growth. Chloramine-T is a compatible algaecide that can be used to combat growth but a more effective maintenance plan would include switching out the fluid with newly distilled water every six month. The particulates that have been filtered out in the process are also preventative in keeping the system "clean" of contaminants. One thing to note is that distilling water that contains an additive could increase the concentration of that additive in the water.

50/50 Uninhibited Ethylene Glycol/Water (-15°C to + 60°C)
Ethylene glycol is used to depress the freezing point of water as a coolant. We recommend not using the uninhibited (no corrosion additives) above 60°C because it breaks down into acidic by-products faster at high temperatures. These acidic by-products, especially carbonic acid, are corrosive to copper. The inhibitors are used to control the corrosion rates by passivating the metal surfaces with an inert film. Uninhibited ethylene glycol is more corrosive to copper than plain water so therefor it should not be recommended unless it is required for the application.

50/50 Inhibited Ethylene Glycol/ Water (-15°C to +90°C)
Inhibited glycol can be used to increase the operating temperature range of the fluid but should not be used as a "pre-mixed anticorrosive" solution. Again, this fluid does break down over time at high temperatures. Dow uses a pH standard of 8 to base when the fluid has become corrosive. Dowtherm is an ethylene based product that contains dipotassium phosphates in a 4% concentration. The recommended use of Dowtherm is mixing with distilled or deionized water or water that contains less than 25 ppm chloride and sulfate and less than 100 ppm total hardness of CACO3. The general term, inhibited glycol/water, almost too close to meaning inhibited water. Inhibited water can have many types of additives including chromate that will foul our cooling system very quickly. Some inhibitor additives can release the bonding agent in the carbon graphite in the PD2 pumps and therefor are incompatible, such as Sodium Hydroxide.

50/50 Uninhibited Propylene Water (-15°C to + 60°C)
Although the use of this glycol similar to ethylene glycol, propylene glycol is considered "safe" to use in the food industry. Propylene is less dense than ethylene and therefor will have a tendency to weep more through mechanical seals.

50/50 Inhibited Propylene/ Water (-15°C to +90°C)
Same issues as with uninhibited propylene and inhibited ethylene glycol.

Deionized water (1-3 megohm, compensated, +5°C to +85°C)
This water has the ions controlled so that they will not conduct and cause galvanic corrosion between dissimilar metals. Deionized water is aggressive to metal when it is too pure since this is not the normal state of water. The leaching of metallic ions from the metal surface is seen in pitting.

NEVER use flammable or corrosive fluids with this unit. Do not use automotive anti-freeze. Commercial antifreeze contains silicates that can damage the pump seals. Use of automotive antifreeze will void the manufacturer's warranty.

Wetted Materials

PD PUMPS (PD1 Part Number 008816, PD2 Part Number 008806):
Carbon Graphite (Graphitar Type B)
Brass
303 Stainless Steel
Ceramic (85% Aluminum Oxide and Balance is Considered Glass)
Fluorocarbon (Viton equivalent)
Ultem (relief Valve Material)

MD-30 (Part Number 026922):
Polypropylene
Ceramic
Magnet
Buna-N

CP-55 PUMP (Part Number 026652):
Stainless Steel
Viton

Evaporator
(Part Numbers 026964/026945/026880):
AISI 316 Stainless Steel
Copper Brazing

Tank Fittings:
Brass

Strainer (Part Number 009334):
Bronze
304 Stainless Steel Mesh

Tank Cap (Part Number 026992):
Nylon

Tank Body (Part Number 026933):
Polyethylene (LLPDE, Mobile NRP=135)

Hose Assemblies/Plumbing:
Buna-N (Parker Push-Lok O-ring)
Nitrile based synthetic rubber (Parker Push-Lok hoses) Part Number 026931
Brass Part Number 032688
Copper Part Number 003752

Ball Valve (Part Number 026981):
Viton
Chrome plated brass body and ball
PTFE

Sealants:
95/5 solder
Bcup5 Brazing
Anearobic Methacrylate Ester (Perma-Lok LM012) - 013002

Low Level/Low Flow Switches (Optiona1):
Polysulphone (Part Number 026900) Low Level
Brass (Part Number 026901) Low Flow

Appendix B RS-232 Serial Communications Protocol

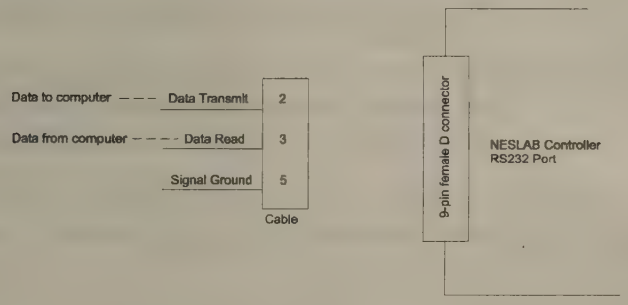
NOTE: This appendix assumes you have a basic understanding of communications protocols.

All data is sent and received in binary form, do not use ASCII. In the following pages the binary data is represented in hexadecimal (hex) format.

The Thermo NESLAB Serial Communications Protocol, NC, is based on a master-slave model. The master is a host computer, while the slave is the chiller's controller. Only the master can initiate a communications transaction (half-duplex). The slave ends the transaction by responding to the master's query. The protocol uses an RS-232 serial interface with the default parameters: 9600 baud, 8 data bits, 1 stop bit, no parity and no handshaking.

NOTE: Before the unit will communicate, RS-232 must be turned on using the controller. Ensure the indicator is illuminated.

The unit can be controlled through your computer's serial port by using the unit's standard 9-pin RS-232 connection. Data read of the serial port connects to the data transmit (pin 2) of the unit. Data transmit of the serial port connects to data read (pin 3) of the unit.



Communication cables are available from Thermo NESLAB. Contact our sales department for additional information.

All commands must be entered in the exact format shown in the tables on the following pages. The tables show all commands available, their format and responses. Controller responses are either the requested data or an error message. The controller response *must* be received before the host sends the next command.

The host sends a command embedded in a single communications packet, then waits for the controller's response. If the command is not understood or the checksums do not agree, the controller responds with an error command. Otherwise, the controller responds with the requested data. If the controller fails to respond within 1 second, the host should resend the command.

NC Serial Communications Protocol

NOTE: All byte values are shown in hex, hex represents the binary values that must be sent to the chiller. **Do not use ASCII.**

The framing of the communications packet in both directions is:

Checksum region

Lead char	Addr-MSB	Addr-LSB	Command	n d-bytes	d-byte 1 ...	d-byte n	Checksum
CA	0	1					

Lead char	CA (hex).
	Device address is 1
Addr-msb	Most significant byte of device address is 0.
Addr-lsb	Least significant byte of device address is 1.
Command	Command byte (see Table 1).
n d-bytes	Number of data bytes to follow (00 to 03 hex).
d-byte 1	1st data byte (the qualifier byte is considered a data byte).
...	...
d-byte n	nth data byte.
Checksum	Bitwise inversion of the 1 byte sum of bytes beginning with the most significant address byte and ending with the byte preceding the checksum. (To perform a bitwise inversion, "exclusive OR" the one byte sum with FF hex.)

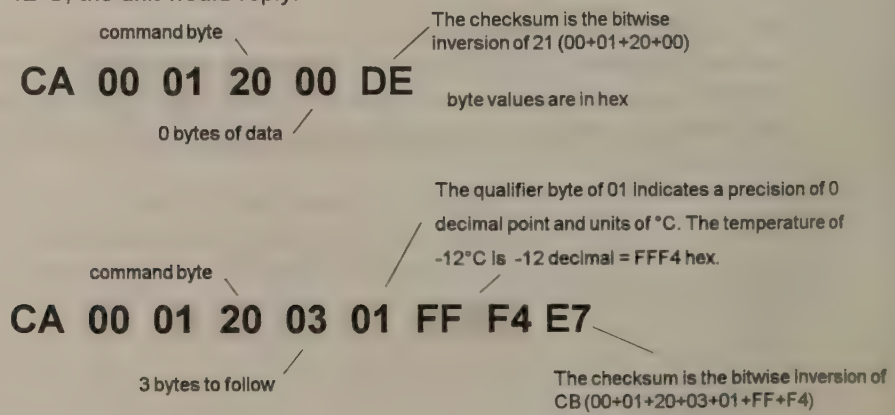
The master requests information by sending one of the Read Functions as shown in Table 1. Since no data is sent to the chiller during a read request, the master uses 00 for the number of data bytes following the command byte.

Appendix B

The chiller will respond to a Read Function by echoing the lead character, address, and command byte, followed by the requested data and checksum. When the chiller sends data, a qualifier byte is sent first, followed by a two byte signed integer (16 bit, MSB sent first). The qualifier byte indicates the precision and units of measure for the requested data as detailed in Table 2.

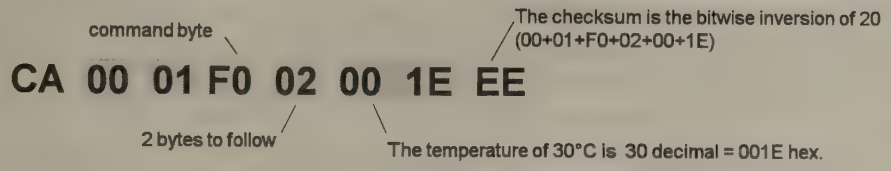
As an example, the master requests to read internal temperature by sending:

If the temperature is -12°C, the unit would reply:


command byte
The checksum is the bitwise inversion of 21 (00+01+20+00)
CA 00 01 20 00 DE
byte values are in hex
0 bytes of data
The qualifier byte of 01 indicates a precision of 0 decimal point and units of °C. The temperature of -12°C is -12 decimal = FFF4 hex.
command byte
CA 00 01 20 03 01 FF F4 E7
3 bytes to follow
The checksum is the bitwise inversion of CB (00+01+20+03+01+FF+F4)

The master sets parameters in the chiller by sending one of the Set Functions as shown in Table 1. The master does not send a qualifier byte in the data field. The master should be preprogrammed to send the correct precision and units (it could also read the parameter of interest first to decode the correct precision and units needed).

For example, if the master wants to set the setpoint to 30°C, it would send :


command byte
The checksum is the bitwise inversion of 20 (00+01+F0+02+00+1E)
CA 00 01 F0 02 00 1E EE
2 bytes to follow
The temperature of 30°C is 30 decimal = 001E hex.

The unit responds:

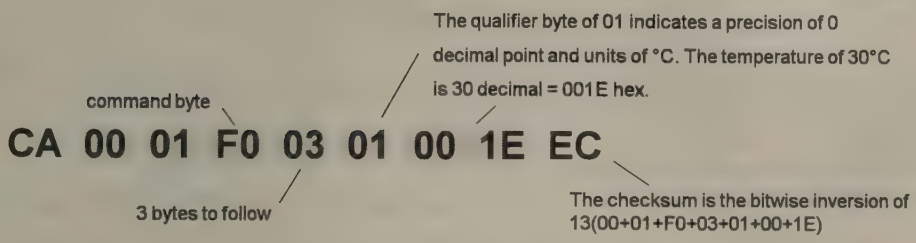

The qualifier byte of 01 indicates a precision of 0 decimal point and units of °C. The temperature of 30°C is 30 decimal = 001E hex.
command byte
CA 00 01 F0 03 01 00 1E EC
3 bytes to follow
The checksum is the bitwise inversion of 13(00+01+F0+03+01+00+1E)

Table 1 Commands (All bytes are in hex)

FUNCTION	MASTER SENDS	UNIT RESPONDS
READ		
Read Acknowledge	CA 00 01 **00** 00 FE	CA 00 01 **00** 02 v1 v2 cs
Read Status*	CA 00 01 **09** 00 F5	CA 00 01 **09** 02 d1 d2 cs
Error		CA 00 01 **0F** 02 en ed cs
Read Internal Temperature (RTD1)	CA 00 01 **20** 00 DE	CA 00 01 **20** 03 qb d1 d2 cs
Read External Temperature(RTD2)	CA 00 01 **21** 00 DD	CA 00 01 **21** 03 qb d1 d2 cs
Read Setpoint (control point)	CA 00 01 **70** 00 8E	CA 00 01 **70** 03 qb d1 d2 cs
Read Low Temperature Limit	CA 00 01 **40** 00 BE	CA 00 01 **40** 03 qb d1 d2 cs
Read High Temperature Limit	CA 00 01 **60** 00 9E	CA 00 01 **60** 03 qb d1 d2 cs
Read Cool Proportional Band (P)	CA 00 01 **74** 00 8A	CA 00 01 **74** 03 qb d1 d2 cs
Read Cool Integral (I)	CA 00 01 **75** 00 89	CA 00 01 **75** 03 qb d1 d2 cs
Read Cool Derivative (D)	CA 00 01 **76** 00 88	CA 00 01 **76** 03 qb d1 d2 cs
Read Heat Proportional Band (P)	CA 00 01 **71** 00 8D	CA 00 01 **71** 03 qb d1 d2 cs
Read Heat Integral (I)	CA 00 01 **72** 00 8C	CA 00 01 **72** 03 qb d1 d2 cs
Read Heat Derivative (D)	CA 00 01 **73** 00 8B	CA 00 01 **73** 03 qb d1 d2 cs

command bytes shown in **bold**
qb = qualifier byte, see Table 2
d1,d2 = 16 bit signed integer of the value being sent or received
cs = the checksum of the string (see text)
* See Read Status, see Table 3

v = protocol version
ed = error data
en = error number 01: Bad command, 02: Bad data, 03: Bad checksum
xx = no valid data, include in checksum

Table 1 Commands (continued) (All bytes are in hex)

FUNCTION	MASTER SENDS	UNIT RESPONDS
SET		
Set Setpoint (control point)*	CA 00 01 **F0** 02 d1 d2 cs	CA 00 01 **F0** 03 qb d1 d2 cs
Set Low Temp	CA 00 01 **C0** 02 d1 d2 cs	CA 00 01 **C0** 03 qb d1 d2 cs
Set High Temp	CA 00 01 **E0** 02 d1 d2 cs	CA 00 01 **E0** 03 qb d1 d2 cs
Set Cool Proportional Band (P=1-99.9)	CA 00 01 **F4** 02 d1 d2 cs	CA 00 01 **F4** 03 qb d1 d2 cs
Set Cool Integral (I = 0-9.99)	CA 00 01 **F5** 02 d1 d2 cs	CA 00 01 **F5** 03 qb d1 d2 cs
Set Cool Derivative (D= 0-5.0)	CA 00 01 **F6** 02 d1 d2 cs	CA 00 01 **F6** 03 qb d1 d2 cs
Set Heat Proportional Band (P=1-99.9)	CA 00 01 **F1** 02 d1 d2 cs	CA 00 01 **F1** 03 qb d1 d2 cs
Set Heat Integral (I = 0-9.99)	CA 00 01 **F2** 02 d1 d2 cs	CA 00 01 **F2** 03 qb d1 d2 cs
Set Heat Derivative (D= 0-5.0)	CA 00 01 **F3** 02 d1 d2 cs	CA 00 01 **F3** 03 qb d1 d2 cs
Set On/Off Array**	CA 00 01 **81** 02 d1... d4 cs	CA 00 01 **81** 01 d1...d4 cs
Turn Off	CA 00 01 **81** 01 00 7C	CA 00 01 **81** 01 d1 cs
Turn On	CA 00 01 **81** 01 01 7B	CA 00 01 **81** 01 d1 cs
Is On or Off?	CA 00 01 **81** 01 02 7A	CA 00 01 **81** 01 d1 cs

* = limited to the range of the chiller
command bytes shown in **bold**
qb = qualifier byte, see Table 2
d1,d2 = 16 bit signed integer of the value being sent or received
cs = the checksum of the string (see text)

** d1: 0 = Off (unit)
1 = On
2 = No Change
di: 1 = unit on/off
2 = external sensor
3 = fault mode
4 = tenths display

Table 2
QUALIFIER BYTE

00	0 precision, no units of measure
01	0 precision, °C
10	1 precision, no units of measure
11	1 precision, °C
20	2 precision, no units of measure

Example: The temperature of 45.6°C would be represented by the qualifier 11 hex, followed by the 2 bytes 01 C8 hex (456 decimal).

Table 3
READ STATUS

BIT	d1	d2
b.7 = 1	RTD2 Enabled	Reserved
b.6 = 1	Reserved	Freeze Fault
b.5 = 1	Low Flow Warning	RTD1 Fault
b.4 = 1	Low Level Warning	RTD2 Fault/Warning
b.3 = 1	High or Low Temp Warning	High Temp Fault
b.2 = 1	High or Low Temp Bypass	Low Temp Fault
b.1 = 1	Unit Faulted	Low Flow Fault
b.0 = 1	Unit Running	Low Level Fault

Appendix C RS-485 Serial Communications Protocol

NOTE: This appendix assumes you have a basic understanding of communications protocols.

All data is sent and received in binary form, do not use ASCII. In the following pages the binary data is represented in hexadecimal (hex) format.

The Thermo Neslab Serial Communications Protocol, NC, is based on a master-slave model. The master is a host computer, while the slave is the bath's controller. Only the master can initiate a communications transaction (half-duplex). The slave ends the transaction by responding to the master's query. The protocol uses an RS-485 serial interface with the default parameters: 9600 baud, 1 start bit, 8 data bits, 1 stop bit, no parity and a selectable address from 1 to 100.

NOTE: Before the unit will communicate, RS-485 must be turned on using the controller. Ensure the indicator is illuminated.

The unit can be controlled through your computer's RS-485 serial port by using the unit's 9-pin RS-485 connection. Communication cables are available from Thermo NESLAB. Contact our sales department for additional information.

All commands must be entered in the exact format shown in the tables on the following pages. The Tables on the last page of this Appendix show all commands available, their format and responses. Controller responses are either the requested data or an error message. The controller response *must* be received before the host sends the next command.

The host sends a command embedded in a single communications packet, then waits for the controller's response. If the command is not understood or the checksums do not agree, the controller responds with an error command. Otherwise, the controller responds with the requested data. If the controller fails to respond within 1 second, the host should resend the command.

NC Serial Communications Protocol

NOTE: All byte values are shown in hex, hex represents the binary values that must be sent to the bath. **Do not use ASCII.**

The framing of the communications packet in both directions is:

Checksum region

Lead char CC	Addr-MSB	Addr-LSB	Command	n d-bytes	d-byte 1 ...	d-byte n	Checksum

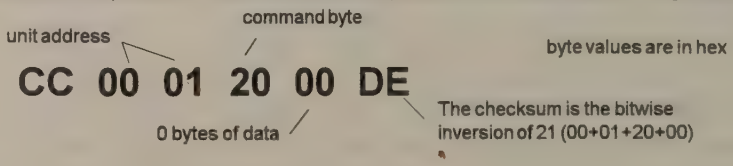
Lead char	CC (hex).
Addr-msb	Most significant byte of device address is 00 hex.
Addr-lsb	Least significant byte of device address in hex (01 to 63 hex).
Command	Command byte (see Table 1).
n d-bytes	Number of data bytes to follow (00 to 03 hex).
d-byte 1	1st data byte (the qualifier byte is considered a data byte).
...	...
d-byte n	nth data byte.
Checksum	Bitwise inversion of the 1 byte sum of bytes beginning with the most significant address byte and ending with the byte preceding the checksum. (To perform a bitwise inversion, "exclusive OR" the one byte sum with FF hex.)

The master requests information by sending one of the Read Functions as shown in Table 1. Since no data is sent to the bath during a read request, the master uses 00 for the number of data bytes following the command byte.

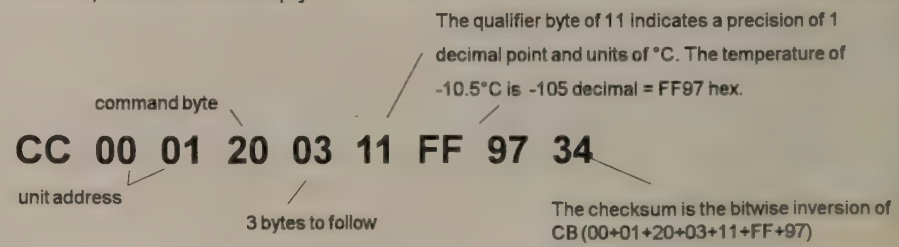
The bath will respond to a Read Function by echoing the lead character, address, and command byte, followed by the requested data and checksum. When the bath sends data, a qualifier byte is sent first, followed by a two byte signed integer (16 bit, MSB sent first). The qualifier byte indicates the precision and units of measure for the requested data as detailed in Table 2.

Appendix C

As an example, the master requests to read internal temperature unit address 01 by sending:

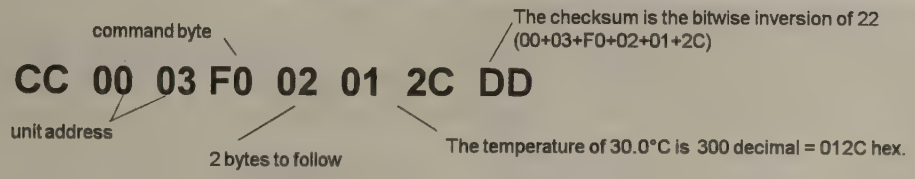

unit address
command byte
byte values are in hex
CC 00 01 20 00 DE
0 bytes of data
The checksum is the bitwise inversion of 21 (00+01+20+00)

If the temperature is -10.5°C, unit #1 would reply:


The qualifier byte of 11 indicates a precision of 1 decimal point and units of °C. The temperature of -10.5°C is -105 decimal = FF97 hex.
command byte
CC 00 01 20 03 11 FF 97 34
unit address
3 bytes to follow
The checksum is the bitwise inversion of CB (00+01+20+03+11+FF+97)

The master sets parameters in the bath by sending one of the Set Functions as shown in Table 1. The master does not send a qualifier byte in the data field. The master should be preprogrammed to send the correct precision and units (it could also read the parameter of interest first to decode the correct precision and units needed).

For example, if the master wants to set the setpoint to 30°C for unit #3, it would send :


command byte
The checksum is the bitwise inversion of 22 (00+03+F0+02+01+2C)
CC 00 03 F0 02 01 2C DD
unit address
2 bytes to follow
The temperature of 30.0°C is 300 decimal = 012C hex.

Unit #3 responds:

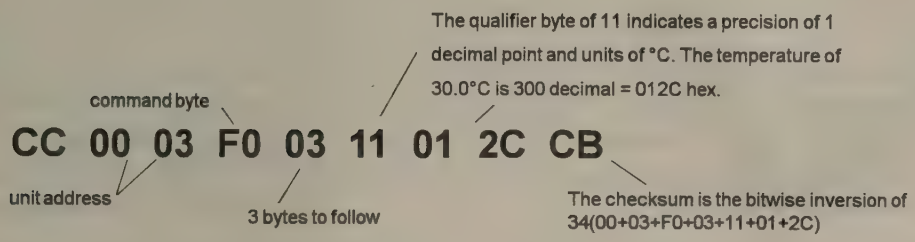

The qualifier byte of 11 indicates a precision of 1 decimal point and units of °C. The temperature of 30.0°C is 300 decimal = 012C hex.
command byte
CC 00 03 F0 03 11 01 2C CB
unit address
3 bytes to follow
The checksum is the bitwise inversion of 34(00+03+F0+03+11+01+2C)

Table 1 Commands (All bytes are in hex)

FUNCTION	MASTER SENDS	UNIT RESPONDS
READ		
Read Acknowledge	CC 00 01 **00** 00 FE	CC 00 01 **00** 02 v1 v2 cs
Read Status*	CC 00 01 **09** 00 F5	CC 00 01 **09** 02 d1 d2 cs
Error		CC 00 01 **0F** 02 en ed cs
Read Internal Temperature	CC 00 01 **20** 00 DE	CC 00 01 **20** 03 qb d1 d2 cs
Read Setpoint (control point)	CC 00 01 **70** 00 8E	CC 00 01 **70** 03 qb d1 d2 cs
Read Low Temperature Limit	CC 00 01 **40** 00 BE	CC 00 01 **40** 03 qb d1 d2 cs
Read High Temperature Limit	CC 00 01 **60** 00 9E	CC 00 01 **60** 03 qb d1 d2 cs
Read Cool Proportional Band (P)	CC 00 01 **74** 00 8A	CC 00 01 **74** 03 qb d1 d2 cs
Read Cool Integral (I)	CC 00 01 **75** 00 89	CC 00 01 **75** 03 qb d1 d2 cs
Read Cool Derivative (D)	CC 00 01 **76** 00 88	CC 00 01 **76** 03 qb d1 d2 cs
Read Heat Proportional Band (P)	CC 00 01 **71** 00 8D	CC 00 01 **71** 03 qb d1 d2 cs
Read Heat Integral (I)	CC 00 01 **72** 00 8C	CC 00 01 **72** 03 qb d1 d2 cs
Read Heat Derivative (D)	CC 00 01 **73** 00 8B	CC 00 01 **73** 03 qb d1 d2 cs

command bytes shown in **bold**
qb = qualifier byte, see Table 2
d1,d2 = 16 bit signed integer of the value being sent or received
cs = the checksum of the string (see text)
* See Read Status, see Table 3

v = protocol version
ed = error data
en = error number 01: Bad command, 02: Bad data, 03: Bad checksum
xx = no valid data, include in checksum

Table 1 Commands (continued) (All bytes are in hex)

FUNCTION	MASTER SENDS	UNIT RESPONDS
SET		
Set Setpoint (control point)*	CC 00 01 **F0** 02 d1 d2 cs	CC 00 01 **F0** 03 qb d1 d2 cs
Set Low Temp	CC 00 01 **C0** 02 d1 d2 cs	CC 00 01 **C0** 03 qb d1 d2 cs
Set High Temp	CC 00 01 **E0** 02 d1 d2 cs	CC 00 01 **E0** 03 qb d1 d2 cs
Set Cool Proportional Band (P=1-99.9)	CC 00 01 **F4** 02 d1 d2 cs	CC 00 01 **F4** 03 qb d1 d2 cs
Set Cool Integral (I = 0-9.99)	CC 00 01 **F5** 02 d1 d2 cs	CC 00 01 **F5** 03 qb d1 d2 cs
Set Cool Derivative (D= 0-5.0)	CC 00 01 **F6** 02 d1 d2 cs	CC 00 01 **F6** 03 qb d1 d2 cs
Set Heat Proportional Band (P=1-99.9)	CC 00 01 **F1** 02 d1 d2 cs	CC 00 01 **F1** 03 qb d1 d2 cs
Set Heat Integral (I = 0-9.99)	CC 00 01 **F2** 02 d1 d2 cs	CC 00 01 **F2** 03 qb d1 d2 cs
Set Heat Derivative (D= 0-5.0)	CC 00 01 **F3** 02 d1 d2 cs	CC 00 01 **F3** 03 qb d1 d2 cs
Set On/Off Array**	CC 00 01 **81** 02 d1 d2 cs	CC 00 01 **81** 01 d1 cs
Turn Off	CC 00 01 **81** 01 00 7C	CC 00 01 **81** 01 d1 cs
Turn On	CC 00 01 **81** 01 01 7B	CC 00 01 **81** 01 d1 cs
Is On or Off?	CC 00 01 **81** 01 02 7A	CC 00 01 **81** 01 d1 cs

* = limited to the range of the chiller
command bytes shown in **bold**
qb = qualifier byte, see Table 2
d1,d2 = 16 bit signed integer of the value being sent or received
cs = the checksum of the string (see text)

** d1: 0 = Off (unit)
1 = On
2 = No change

Table 2

QUALIFIER BYTE

00	0 precision, no units of measure
01	0 precision, °C
10	1 precision, no units of measure
11	1 precision, °C
20	2 precision, no units of measure

Example: The temperature of 45.6°C would be represented by the qualifier 11 hex, followed by the 2 bytes 01 C8 hex (456 decimal).

Table 3

READ STATUS

BIT	d1	d2
b.7 = 1	0	Reserved
b.6 = 1	Reserved	Freeze Fault
b.5 = 1	Low Flow Warning	RTD1 Fault
b.4 = 1	Low Level Warning	0
b.3 = 1	High or Low Temp Warning	High Temp Fault
b.2 = 1	High or Low Temp Bypass	Low Temp Fault
b.1 = 1	Unit Faulted	Low Flow Fault
b.0 = 1	Unit Running	Low Level Fault

WARRANTY

Thermo NESLAB warrants for 24 months from date of shipment any Thermo NESLAB unit according to the following terms.

Any part of the unit manufactured or supplied by Thermo NESLAB and found in the reasonable judgment of Thermo NESLAB to be defective in material or workmanship will be repaired at an authorized Thermo NESLAB Repair Depot without charge for parts or labor. The unit, including any defective part must be returned to an authorized Thermo NESLAB Repair Depot within the warranty period. The expense of returning the unit to the authorized Thermo NESLAB Repair Depot for warranty service will be paid for by the buyer. Thermo NESLAB's responsibility in respect to warranty claims is limited to performing the required repairs or replacements, and no claim of breach of warranty shall be cause for cancellation or recision of the contract of sales of any unit.With respect to units that qualify for field service repairs, Thermo NESLAB's responsibility is limited to the component parts necessary for the repair and the labor that is required on site to perform the repair. Any travel labor or mileage charges are the financial responsibility of the buyer.

The buyer shall be responsible for any evaluation or warranty service call (including labor charges) if no defects are found with the Thermo NESLAB product.

This warranty does not cover any unit that has been subject to misuse, neglect, or accident. This warranty does not apply to any damage to the unit that is the result of improper installation or maintenance, or to any unit that has been operated or maintained in any way contrary to the operating or maintenance instructions specified in Thermo NESLAB's Instruction and Operation Manual. This warranty does not cover any unit that has been altered or modified so as to change its intended use.

In addition, this warranty does not extend to repairs made by the use of parts, accessories, or fluids which are either incompatible with the unit or adversely affect its operation, performance, or durability.

Thermo NESLAB reserves the right to change or improve the design of any unit without assuming any obligation to modify any unit previously manufactured.

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